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ABSTRACT

This guide contains information needed for teaching the required seventh and eighth grade industrial arts exploration course in the middle schools of Prince George's County Public Schools, Upper Marlboro, Maryland. Introductory activities are included for the four broad high school areas of graphic communications, manufacturing, energy and transportation, and construction. The curriculum guide is organized into four sections. The first section describes the mission of industrial arts in the middle school program. Section 2 provides suggestions for using the middle school schedule effectively, and for accommodating all students in a required course. The remaining two sections present the information used by teachers in implementing the seventh and eighth grade courses. For each level, course descriptions, course objectives, instructional strategies and resources, plans for teacher direction and student participation, and student evaluation information are included. Appendixes to each grade level course contain worksheets, quizzes, handouts, transparency masters, learning activity packages, and evaluation record sheets. (KC)

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INDUSTRIAL ARTS CURRICULUM GUIDE--MIDDLE SCHOOL

Prince George's County Public Schools
Upper Marlboro, Maryland 20870
Edward J. Feeney, Superintendent of Schools
October, 1981

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PREFACE

The middle school provides a new organization for the educational delivery system in grades 7 and 8. This new organization effects Industrial Arts in the following ways.

1) All students are required to take 9 weeks of Industrial Arts in grades 7 and/or 8 as part of their exploratory program.

2) Industrial Arts classes will meet for approximately 84 minutes, every other day.

The Industrial Arts program in the middle school is based on content priorities taken from the junior high school program. Instructional strategies from the junior high program which are consistent with the middle school philosophy are also employed.

INTRODUCTION

This curriculum guide is organized into sections. The first section describes the mission of Industrial Arts in the middle school program. Section two provides suggestions for utilizing effectively the middle school schedule, and for accommodating all students in a required course. The remaining two sections present the information used by teachers in implementing the 7th and 8th grade courses.

Teachers are encouraged to consider this guide as a "working" document. As such, teachers should feel free to make pencil notes on its pages. Suggestions for improving this guide are welcome and appreciated.

W. Harley Smith

W. Harley Smith
Supervisor of Industrial Arts

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MISSION OF INDUSTRIAL ARTS IN THE MIDDLE SCHOOL--

Each student will be introduced to selected high school elective areas through a required exploration program in middle school grades 7 and 8. The Industrial Arts component of the middle school exploration program will provide introductory activities in the four broad high school areas of

Graphic Communications,
Manufacturing,
Energy and Transportation,
Construction.

These Industrial Arts activities will further the discovery and development of each student's interests and potential as an effective producer and/or consumer in the industrial-technological society. Benefits to students include:

- practical skills and knowledge useful in selected careers.
- practical skills and knowledge useful in consumer and avocational applications.
- increased ability to make wise educational and career choices.
- awareness of selected areas of technology which have a significant impact on the public.

II. FUNCTIONING IN THE MIDDLE SCHOOL ORGANIZATION

A. Utilizing The Middle School Schedule

The middle school schedule provides that Industrial Arts classes meet every other day with an extended session during a nine-week period. Teachers will meet three classes per day, and will be assigned six classes each nine-week period. This schedule gives rise to the need for teachers to make special preparations and provisions in the Industrial Arts program. They are:

1. Hold Student Interest In Long Class Sessions--
   Instructional activities which do not engage students in active laboratory participation should be carefully planned to incorporate variety and appeal for students. An extended-length class session without variety, appeal and student participation will lack effectiveness.

2. Plan For Continuous Instructional Activity--
   Available time for the Industrial Arts program and extended-length class sessions require that students and teachers use each class session to the fullest. Teachers should plan and structure student assignments such that students whose progress in one area is delayed (due to drying time, setting time, or temporary inavailability of equipment) will have another purposeful activity to pursue in the interum.

3. Utilize Short-Term Activities--
   Instructional activities to meet course objectives should be selected and designed to be short in duration. Carefully selected and designed activities can be as effective in meeting the objectives for the middle school Industrial Arts program as those which may require more time to complete. Efficient use of instructional time will enable course objectives to be met in the time available.

4. Use "Warm-Up" Activities--
   The absence of bells to signal the start of class will require the teacher to structure a method of getting students prepared promptly for purposeful tasks. The warm-up is a good technique for accomplishing this. Furthermore, it has great potential as a technique for introducing content, reviewing information, and reinforcing basic skills. Warm-up activities should be assignments which students can begin upon entering the classroom without special oral instructions from the teacher, and which can be accomplished in only a few minutes. Warm-up assignments may require students to:

   1. copy information or terms from the chalkboard.
   2. look up and define a few terms using a text.
   3. read a brief passage and answer a question.
   4. make a calculation.
   5. take measurements.
   6. write a progress statement

5. Review And Reinforce Instruction From Previous Class Meetings--
The intervals between class meetings may require the teacher to review and reinforce instruction more regularly and frequently to refresh student knowledge of information and procedures.

B. Accommodating All Students In A Required Course

The requirement of all middle school students to take Industrial Arts in grades 7 and 8 will be a new opportunity for the Industrial Arts program, as well as for the students. It may also increase the number of Industrial Arts students who lack initial motivation and sufficient confidence to participate eagerly in laboratory activities. To accommodate such students, the following recommendations are made.

1. Emphasize The Factors For Success In Industrial Arts--Success Is:
   - Not a result of previous experience, but a result of seriously trying all the time.
   - Not a result of physical strength, but a result of careful use of tools and materials.
   - Not a result of being able to work fast, but a result of using time wisely.
   - Not a result of competing with others, but a result of working cooperatively together.

2. Cite Examples Of Previous Success By Both Boys And Girls--
When showing previously produced projects, and pictures of such projects and student activities for motivational purposes, include and cite examples of girls. Emphasize that all students are expected to (and do) actively participate in laboratory activities. Point out that success in Industrial Arts is not dependent upon a person's sex.

3. Emphasize The Career And Consumer Value Of Industrial Arts Experience For Both Men And Women--
   - Careers which involve working with tools and materials are open to both men and women. The number of women in technical careers is growing each year. Industrial Arts helps to discover interests and abilities in many technical areas.
   - Consumers who have knowledge and ability to use tools and materials are:
     a. better judges of product and service quality,
     b. able to save money with "do it yourself" projects,
     c. able to enjoy doing home and community projects and activities, and
     d. more aware of product service and maintenance requirements.

COURSE Industrial Arts Exploration 7 COURSE NO. _____

1. COURSE DESCRIPTION

Students in this course will be introduced to the Industrial Arts areas of "Graphic Communications" and "Manufacturing." Students will use tools and materials to produce projects involving drafting and printing; and working with wood, metal, and plastic. The activities will provide career exploration as well as skills and knowledge with practical and leisure time application.

2. COURSE OBJECTIVES

Students will demonstrate ability to:

- produce and read an orthographic multi-view sketch.
- design a vehicle mock-up.
- develop a pattern.
- produce a printed project
- use measuring and layout tools.
- use tools and processes to cut, form, shape and finish wood, metal, and plastic materials.
- assemble products using mechanical fasteners and bonding techniques.
- perform production line manufacturing activities.
- use career information resources to investigate an occupation.

In achieving the above objectives, students will perform at least the following "Project Basic" competencies:

- Follow textbook instruction.
- Understand caution and warning signs.
- Follow step-by-step directions for emergencies.
- Follow step-by-step directions to complete a school or job assignment.
- Follow step-by-step directions for putting together a "do-it-yourself" kit.
- Use directions to follow a pattern.
- Follow step-by-step directions for appliance use.
- Spot key words necessary for getting information at school, work, and living in society.
- Get necessary information for the home from consumer information and government pamphlets.
- Fill out school forms and application forms.
- Write lists.
- Take notes from spoken or written materials.
- Write a sentence that makes a statement.
- Write two or more related sentences on a single topic or idea.
- Write a paragraph in response to a question.
- Write a paragraph to summarize ideas read or heard.
- Add, subtract, multiply, and divide whole numbers.
- Add and subtract mixed numbers.
- Read scales on measuring instruments.
- Use information from tables and graphs.
- Choose an appropriate unit of measure.
- Demonstrate safety practices.
- Identify ways to enter the world of work.
- Identify skills, knowledge, and training required for major types of jobs.
- Identify school subjects which help develop skills, knowledge, and training for different jobs.
- Identify basic requirements for getting certain jobs.
- Identify jobs that interest you.
- Identify qualities employers look for in job applicants.
- Describe behavior that is appropriate for a particular work situation.
- Describe the importance of time in a particular work setting.
- List some of your personal characteristics based on school work, test results, and nonschool activities.
- Identify educational opportunities available in selected careers.
- Identify ways of selecting programs, schools, and courses which help prepare you for a job.
- Use school and community resources to obtain career information.
- Participate in introductory recreational activities.

3. INSTRUCTIONAL STRATEGIES AND RESOURCES

OBJECTIVE--STUDENTS WILL:	INSTRUCTIONAL STRATEGY	RESOURCES
Produce And Read An Orthographic Multi-View Sketch	. Teacher Instructs Principles And Demonstrates Procedure For Orthographic Multi-View Sketching . Students Produce Plan For Their First Individual Project . Students Follow Teacher-Provided Plans For Subsequent Projects	Feirer, J.L. And Lindbeck, J.R., Drawing And Planning For Industrial Arts, Charles A. Bennett Co., Inc., 1975 Ross, Stan, The World Of Drafting, McKnight Publishing Co., 1971 Walker, J.R., Exploring Drafting, Goodheart-Willcox Co., 1972
Design A Vehicle Mock-Up	. Teacher Instructs Principles of Functional Design For Metric 500 Vehicle . Teacher Instructs Design Criteria For Metric 500 Vehicle . Students Design A Metric 500 Vehicle	Lux, D.G., And Ray, W.E., The World Of Manufacturing, McKnight Publishing Co., 1971 Fales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980
Develop A Pattern	. Teacher Instructs Procedure For Developing A One-To-One Profile Pattern And A One-To-One Symmetric Plan-View Pattern From An Orthographic Multi-View Sketch . Students Produce Patterns From Project Plans	Fales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980
Produce A Printed Project	. Teacher Instructs Principles And Demonstrates Procedure For Producing A Printed Project . Students Produce A Printed Project	Broekhuizen, R.J., Graphic Communications, McKnight Publishing Co., 1979
Use Measuring And Layout Tools	. Teacher Instructs And Demonstrates Use Of Appropriate Measuring And Layout Tools . Students Use Measuring And Layout Tools In Producing Projects	Groneman And Feirer, General Industrial Education, McGraw-Hill, 1974 Fales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980
Use Tools And Processes To Cut, Form, Shape And Finish Wood, Metal, And Plastic Materials	. Teacher Instructs And Demonstrates Appropriate Tools And Processes As Needed . Students Use Tools And Processes To Produce Projects Utilizing Wood, Metal, And Plastic; Selecting From Teacher-Provided Project Choices	Groneman And Feirer, General Industrial Education, McGraw-Hill, 1974 Fales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980
Assemble Products Using Mechanical Fasteners And Bonding Techniques	. Teacher Instructs And Demonstrates Use Of Appropriate Mechanical Fasteners And Bonding Techniques As Needed . Students Use Mechanical Fasteners And Bonding Techniques In Producing Projects	Groneman And Feirer, General Industrial Education, McGraw-Hill, 1974 Fales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980

COURSE Industrial Arts Exploration 7 COURSE NO.

3. INSTRUCTIONAL STRATEGIES AND RESOURCES (continued)

OBJECTIVE--STUDENTS WILL:	INSTRUCTIONAL STRATEGY	RESOURCES
Perform Production Line Manufacturing Activities	. Teacher Provides Production Line Set-Up With Specialized Jigs And Fixtures For Producing A Product . Teacher Instructs Principles Of Line Production . Teacher Demonstrates Use Of Tools, Equipment, And Specialized Production Hardware . Students Produce Products Using The Production Line	Groneman And Feirer, General Industrial Education, McGraw-Hill, 1974 Eales, J., Manufacturing - A Basic Text For Industrial Arts, McKnight Publishing Co., 1980
Use Career Information Resources To Investigate An Occupation	. Teacher Explains Activity Requirements . Teacher Or Media Specialist Demonstrates Use Of Appropriate Resources . Students Individually Select An Appropriate Occupation, Investigate Using Available Resources, And Prepare Reports	Guidance Information System (G.I.S. Retrieved From Computer Terminal) U.S. Department of Labor, Dictionary Of Occupational Titles, 1977 U.S. Department of Labor, Occupational Outlook Handbook, Bi-annual

COURSE Industrial Arts Exploration 7 COURSE NO.

4. PLAN OF TEACHER DIRECTION AND STUDENT PARTICIPATION

DAY	NOTES CODE	TEACHER ACTIVITY	STUDENT ACTIVITY
1	7.1.1	Introduce Students to Industrial Arts and Class Activities	Listen and Observe
		Orient Students To the Class Management (Class Rules, Procedures, and Grading)	Listen and Observe
		Assign Seats	
		Discuss General Safety Rules	Listen and Observe
2		Assign Lockers and Safety Glasses	
		Administer Quiz -- on General Safety Rules	Take Quiz
	7.2.1	Orient Students to Line Production Activity -- Discuss concepts of specialization in labor and tooling, and interchangeability of parts. Contrast Line Production and Limited Production Techniques.	Listen and Discuss
	7.2.2	Demonstrate Production Line	Listen and Observe
3		Review Quiz--on General Safety Rules	Listen and Discuss
		Organize Clean-up Systems	
		Observe and Assist Students	Use Tools and Materials in Line Production
4		Observe and Assist Students	Use Tools and Materials in Line Production
5	7.5.1	Introduce Students to the Design and Construction Activity for the Metric Dragster--Discuss Procedures, Skills, and Career Implications	Listen and Observe
	7.5.2	Demonstrate Use of 2-View Drawing in Project Planning	Listen and Observe
		Assign Sketching Worksheet (2-View Exercises)	
		Observe and Assist Students	Complete Sketching Worksheet
6		Review Sketching Worksheet	Listen, Observe and Discuss
	7.6.1	Discuss Metric Dragster Specifications	Listen and Discuss
	7.6.2	Discuss Functional and Aesthetic Aspects of Design	Listen and Discuss
		Assign Metric Dragster Design Worksheet	
		Observe and Assist Students	Complete Design Worksheet
7	7.7.1	Demonstrate Use of Metric Linear Measurement	Listen and Observe
		Assign Metric Linear Measurement Worksheet	
		Observe and Assist Students	Complete Measurement Worksheet
		Review Metric Linear Measurement Worksheet	Listen, Observe and Discuss
	7.7.2	Demonstrate Use of Drafting Instruments to Draw View Blocks and Border of Project Plan	Listen and Observe
8		Observe and Assist Students	Use Drafting Instruments and Sketch to Produce Project Plan
	7.8.1	Demonstrate Making and Using Patterns	Listen and Observe
9	7.9.1	Demonstrate Drilling Operations for Metric Dragster	Listen and Observe
	7.9.2	Demonstrate Profile Cutting on Scroll Saw	Listen and Observe
	7.9.3	Demonstrate Cutting With a Coping Saw	Listen and Observe
10	7.10.1	Demonstrate Shaping With Surform, File and Plane; and Shaping and Smoothing with Sandpaper	Listen and Observe
		Administer Quiz--on Drilling, Cutting, and Shaping	Take Quiz
		Review Quiz on Drilling, Cutting, and Shaping	Listen and Discuss
		Observe and Assist Students	Work on Dragster Project

COURSE Industrial Arts Exploration 7 COURSE NO.

PLAN OF TEACHER DIRECTION AND STUDENT PARTICIPATION

DAY	NOTES CODE	TEACHER ACTIVITY	STUDENT ACTIVITY
11	7.11.1	Demonstrate/Orient Students to LAPS (1) Observe and Assist Students	Listen and Observe Work on Dragster Project
12		Observe and Assist Students	Work on Printing LAP/ Dragster Projects
13	7.13.1	Demonstrate Sealing, Brush Painting, and Final Assembly of Metric Dragster Project Observe and Assist Students	Listen and Observe Work on Dragster Projects
14	7.14.1	Demonstrate/Orient Students to LAPS (2) Observe and Assist Students	Listen and Observe Work on Dragster Projects
15		Observe and Assist Students	Work on LAPS/Dragster Projects
16		Observe and Assist Students	Work on LAPS/Dragster Projects
17		Observe and Assist Students	Work on LAPS/Dragster Projects
18		Observe and Assist Students	Work on LAPS/Dragster Projects
19		Observe and Assist Students	Participate in Dragster Competition
20	7.20.1	Summarize Course Implications for Career and Education Planning Cleanup and Check Out	Listen and Discuss Participate as Necessary
21	7.21.1	Flexible Day	Participate as Necessary
22		Flexible Day	Participate as Necessary

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.1.1

ACTIVITY--Introduce students to Industrial Arts and Class Activities

PURPOSE--To familiarize students with the Industrial Arts program and the activities for the class.

VOCABULARY--

None

PROCEDURE--

Discuss the following questions.

A. What's the value to me?
- Try some job activities to find out what you may like and dislike.
- Learn practical skills and knowledge that are useful-
  - -in many careers
  - -to consumers
  - -in recreation

B. What are we going to do?
- Explore the major areas of Industrial Arts by working with tools and materials.
  - -highlight the two areas for this grade
  - -identify projects, LAPS, tools, and equipment

C. How can I be successful in Industrial Arts?
- Not a result of previous experience, but a result of trying all the time.
- Not a result of physical strength, but a result of careful use of tools and materials.
- Not a result of being able to work fast, but a result of using time wisely.
- Not a result of competing with others, but a result of working cooperatively together.

SUPPORT MATERIAL

Transparency: T-7.1.1-1

Transparency: T-7.1.1-2
Transparency: T-7.1.1-3
Transparency: T-7.1.1-4

Transparency: T-7.1.1-5

Transparency: T-7.1.1-5

Use examples and/or slides

Transparency: T-7.1.1-6

SPECIAL NOTES--

None

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.2.1

ACTIVITY--Orient students to Line Production Activity

PURPOSE--To introduce students to basic concepts of production-line manufacturing.

VOCABULARY--

1. Mass Production
2. Eli Whitney
3. Henry Ford
4. Industry
5. Manufacturing
6. Mechanization
7. Standardization
8. Specialization
9. Automation
10. Process

PROCEDURE--

Discuss the following concepts.

A. Types of Industry
   - Power and Transportation
   - Construction
   - Communications
   - Manufacturing

B. Mass Production Is The Key To American Industry. (Discuss contributions of Eli Whitney and Henry Ford.)

C. What is American Industry?

D. The Manufacturing Industry. (Discuss materials, processes and products. Define quantity manufacturing and custom manufacturing.)

E. Manufacturing (Define Mechanization, Standardization, Specialization, and Automation.)

SUPPORT MATERIAL

DCA - Introduction To Amer. Ind.
Transparency: IND-3

Transparency: IND-2

Transparency: IND-1

Transparency: IND-4

Transparency: IND-27

SPECIAL NOTES--

None

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.2.2

ACTIVITY--Demonstrate Production Line

PURPOSE--To prepare students for participation in a line production activity.

VOCABULARY--

Production Jig - A special tool for guiding a cutter.
Production Fixture - A special tool for holding materials or parts.
Drill Press - A drilling machine.
Twist Drill Bit - A drill cutter for wood, metal or plastic.
Rivet - A fastener for holding metal parts together.
Shear - To cut between two blades.

PROCEDURE--	SUPPORT MATERIAL
Familiarize students with the product to be line produced.	
Use a flow chart to orient students to the production line flow. (See appendix.)	Transparency: T-7.2.2-1
Demonstrate the tools, machines, jigs, fixture and procedures to be used at each work station.	
Organize the students for production--Assign 2 students to each work station. Reassign students to progressive work stations as needed.	

SPECIAL NOTES--

1. Teacher preparations should include making the jigs and fixtures, setting up the production line, and pre-cutting all materials to length and width.
2. Confirm all work station assignments on production days prior to the start of work.
3. Be selective in assigning students to the gluing process.
4. Run sub-lines A, B, D and E the first day of production (hurricane lamp). Run sub-line C and final assembly the second day.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.5.1

ACTIVITY--Introduce students to the Design and Construction Activity for the Metric Dragster.

PURPOSE--To give students: 1) an understanding of some steps used by engineers and designers in the development of products, and 2) an understanding of the steps to be followed in designing and constructing the metric dragster.

VOCABULARY--

1. Industrial Research and Development
2. Sketch
3. Instrument Drawing
4. Grid

PROCEDURE--	SUPPORT MATERIAL
Discuss with students the role of Industrial Research and Development in providing new and improved materials, products, and production methods.	DCA, Introduction To Amer. Ind. Transparency: IND-20
Discuss the following research and development steps to be used by students in designing and constructing a metric dragster.	
A. Sketch two or more design ideas using the Metric Dragster Design Worksheet.	Metric Dragster Design Worksheet
B. Select your best design (student).	
C. Make a full-size drawing of your best design, using drafting instruments and sketching. (Identify drafting instruments and grid paper to be used.)	Show Examples
D. Make patterns for cutting out car body on wood.	Show Examples
E. Glue patterns to wood block using rubber cement.	
F. Drilling holes--for cartridge and axles.	
G. Cut rough shape--using jig saw for profile (front) view and coping saw for plan (top) view.	

COURSE Industrial Arts Exploration 7 COURSE NO. _____

PROCEDURE-- continued

H. Make final shape--using files, planes and surforms.

I. Smooth the car body--using sand papers.

J. Prepare the car body for painting--using sanding sealers and abrasives.

K. Paint and decorate the car body (may be taken home for this activity) using brush-on paint, spray paint, decals, numbers, and tape.

L. Cut axles and bearings to correct length.

M. Assemble the completed car.

N. Enter Metric Dragster Competition--Areas of competition may include: best design, best drawing, best appearance, and fastest.

SUPPORT MATERIAL

SPECIAL NOTES--

1. Teacher preparations should include pre-cutting the wood blanks for the car bodies, producing and setting-up drilling fixtures for axle holes and cartridge hole.
2. Braze welding rod (1/8" dia.) works well as axle material.
3. Plastic soda straws work well as axle bearings.
4. Prepare in advance a "run-off" chart for the race event.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.5.1

ACTIVITY--Introduce students to the Design and Construction Activity for the Metric Dragster.

PURPOSE--To give students: 1) an understanding of some steps used by engineers and designers in the development of products, and 2) an understanding of the steps to be followed in designing and constructing the metric dragster.

VOCABULARY--

1. Industrial Research and Development
2. Sketch
3. Instrument Drawing
4. Grid

PROCEDURE--	SUPPORT MATERIAL
Discuss with students the role of Industrial Research and Development in providing new and improved materials, products, and production methods.	DCA, Introduction To Amer. Ind. Transparency: IND-20
Discuss the following research and development steps to be used by students in designing and constructing a metric dragster.	
A. Sketch two or more design ideas using the Metric Dragster Design Worksheet.	Metric Dragster Design Worksheet
B. Select your best design (student).	
C. Make a full-size drawing of your best design, using drafting instruments and sketching. (Identify drafting instruments and grid paper to be used.)	Show Examples
D. Make patterns for cutting out car body on wood.	Show Examples
E. Glue patterns to wood block using rubber cement.	
F. Drilling holes--for cartridge and axles.	
G. Cut rough shape--using jig saw for profile (front) view and coping saw for plan (top) view.	

COURSE Industrial Arts Exploration 7 COURSE NO.

PROCEDURE-- continued

H. Make final shape--using files, planes and surforms.

I. Smooth the car body--using sand papers.

J. Prepare the car body for painting--using sanding sealers and abrasives.

K. Paint and decorate the car body (may be taken home for this activity) using brush-on paint, spray paint, decals, numbers, and tape.

L. Cut axles and bearings to correct length.

M. Assemble the completed car.

N. Enter Metric Dragster Competition--Areas of competition may include: best design, best drawing, best appearance, and fastest.

SUPPORT MATERIAL

SPECIAL NOTES--

1. Teacher preparations should include pre-cutting the wood blanks for the car bodies, producing and setting-up drilling fixtures for axle holes and cartridge hole.
2. Braze welding rod (1/8" dia.) works well as axle material.
3. Plastic soda straws work well as axle bearings.
4. Prepare in advance a "run-off" chart for the race event.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.5.2

ACTIVITY--Demonstrate Use of Two-View Drawing in Project Planning

PURPOSE--To enable students to read and produce two-view drawings in project planning.

VOCABULARY--

1. Projection
2. Alignment
3. Top View
4. Front View
5. Right Side View
6. Center Line
7. Hidden Line
8. Object Line
9. Multi-View Drawing

PROCEDURE--	SUPPORT MATERIAL
Acquaint students with the conventional three views of a multi-view drawing, emphasizing that the views position on the drawing determines what the view is called. (What is seen in the view does not determine what the view is called.)	Transparency: T-7.5.2-1
Inform the students that only front and top views will be used in their project planning.	
Identify dimensions observed in the front view, pointing out the limitation of seeing only height and length.	Transparency: T-7.5.2-2
Identify dimensions observed in the top view, pointing out the limitation of seeing only width and length.	Transparency: T-7.5.2-3
Demonstrate Alignment and Projection from one view to the other.	Transparency: T-7.5.2-4
Discuss and demonstrate the purposes and formation of object lines, hidden lines, and center lines.	Transparency: T-7.5.2-5

SPECIAL NOTES--

1. Follow this activity by assigning the SKETCHING WORKSHEET.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.6.1

ACTIVITY--Discuss Metric Dragster Specifications

PURPOSE--To enable students to interpret the Metric Dragster Specification Sheet and to develop student familiarity with the Metric Dragster Specifications.

VOCABULARY--

1. Bearing
2. Screweye
3. Washer
4. Dimension

PROCEDURE--

Orient students to the method for reading dimensions on the METRIC DRAGSTER SPECIFICATION SHEET.

Identify important dimensions for the students.

- Dimensions that have latitude (an upper and lower parameter)
- Importance of accuracy on the axle hole and cartridge hole heights in order to fit the starting gate
- Overall height of car can be less than 70mm as shown on the specification sheet, as long as the cartridge is completely enclosed

SUPPORT MATERIAL

Metric Dragster Specification Sheet

Metric Dragster Specification Sheet

SPECIAL NOTES--

1. Provide each student with a copy of the METRIC DRAGSTER SPECIFICATION SHEET to retain for future reference.
2. The METRIC DRAGSTER SPECIFICATION SHEET will be followed by students while drawing their final plan block-in with drafting instruments.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.6.2

ACTIVITY--Discuss Functional and Aesthetic Aspects of Design

PURPOSE--To assist students in developing successful designs by acquainting them with elements of design.

VOCABULARY--

1. Aesthetic
2. Functional
3. Practical

PROCEDURE--

Discuss with students the following questions.

	SUPPORT MATERIAL
A. What makes a good design?	Transparency: T-7.6.2-1
B. What makes it look good? (elements of aesthetics)	Transparency: T-7.6.2-2
C. What makes a design functional?	Transparency: T-7.6.2-3
D. What makes a design practical?	Transparency: T-7.6.2-4

SPECIAL NOTES--

1. Follow this activity by assigning the METRIC DRAGSTER DESIGN WORKSHEET.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.7.1

ACTIVITY--Demonstrate Use of Metric Linear Measurement

PURPOSE--To enable students to read and mark metric linear measurements while planning their metric dragster projects.

VOCABULARY--

1. Linear

PROCEDURE--

Use an enlargement of a metric ruler (transparency, chalkboard illustration, or model) to acquaint students with the numeral markings and increment markings.

SUPPORT MATERIAL

Transparency: T-7.7.1-1

SPECIAL NOTES--

1. Consider two alternatives in using the METRIC LINEAR MEASUREMENT WORKSHEET.
   A. Use the worksheet as a "pre-test" to identify students who are functional in this skill and those needing further instruction.
   B. Use the worksheet as a "post-test" to identify functional and non-functional students in this skill.

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.7.2

ACTIVITY--Demonstrate Use of Drafting Instruments to Draw View Blocks and Border of Project Plan

PURPOSE--To enable students to: 1) use drafting instruments needed to draw horizontal, vertical, and diagonal lines; 2) draw top and front view blocks for their metric dragster plan.

VOCABULARY--

1. View Block
2. T-Square
3. Triangle
4. Horizontal
5. Vertical
6. Construction Line

PROCEDURE--

Demonstrate to students the following procedures.

A. Squaring and securing drafting paper on the drawing board.
B. Drawing horizontal lines with a T-square (pulling the pencil across).
C. Drawing vertical lines with a T-square and triangle (pulling the pencil upward).
D. Drawing non-standard angles with a straight edge.
E. Marking off drawing borders.
F. Positioning the top and front view blocks using light construction lines.
G. Completing the two-view block-in (using METRIC DRAGSTER SPECIFICATION SHEET as a guide).
H. Completing the title block.

SUPPORT MATERIAL

Metric Dragster Specification Sheet

SPECIAL NOTES--

1. The teacher may find expediency in leading the students in the step-by-step development of the drawing border, title block, and view blocks. (The alternative is to demonstrate the complete procedure before students begin.)

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.8.1

ACTIVITY--Demonstrate Making and Using Patterns

PURPOSE--To enable students to make and use patterns for rough cutting their metric dragster projects.

VOCABULARY--

1. Contact Cement

PROCEDURE--	SUPPORT MATERIAL
Demonstrate the procedure for producing and cutting out profile (front view) and top view patterns. Demonstrate the use of rubber contact cement to bond patterns to the wood blank for the car body.	

SPECIAL NOTES--

1. The teacher should determine the methods to be used in producing patterns. Options include using the student's drawings to make diazo prints, carbon paper tracings, or light surface tracings.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.9.1

ACTIVITY--Demonstrate Drilling Operations for Metric Dragster

PURPOSE--To enable students to drill axle holes and cartridge holes in their metric dragster projects.

VOCABULARY--

Spade Bit Twist Drill Chuck Chuck Key Depth Gauge

PROCEDURE--

Demonstrate the use of the drill press, drilling fixture, and twist drill bit in drilling axle holes.

Demonstrate the use of the drill press, drilling fixture, drill press depth gauge, and spade bit in drilling the cartridge hole.

SUPPORT MATERIAL

SPECIAL NOTES--

1. Teacher preparations should include constructing and setting-up the drilling fixtures.
2. Refer to the quiz on Drilling, Cutting, and Shaping to be certain all questions related to drilling are covered.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.9.2

ACTIVITY--Demonstrate Profile Cutting on Scroll Saw

PURPOSE--To enable students to rough cut the profile of their metric dragster projects on the scroll saw.

VOCABULARY--

Thumb Screw
Pressure Foot
Reciprocate
Relief Cut
Scroll

PROCEDURE--

Identify the major parts of the scroll saw and briefly explain their function.

Demonstrate the following features and procedures related to using the scroll saw.

A. Reciprocating motion of the blade--explain the cutting action of the blade and the need for holding down
B. Adjustment of the pressure foot
C. Manual check of machine operation before starting the motor
D. Techniques for cutting curves including placement of hands, feeding material, relief cutting

SUPPORT MATERIAL

SPECIAL NOTES--

1. Scroll saw use in rough cutting the metric dragster will be limited to the profile (front view of plan) cuts.
2. Refer to the quiz on Drilling, Cutting, and Shaping to be certain all questions related to the scroll saw are covered.

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.9.3

ACTIVITY--Demonstrate Cutting with a Coping Saw

PURPOSE--To enable students to complete rough cutting of their metric dragster projects.

VOCABULARY--

Axis Horizontal Vertical

PROCEDURE--

Demonstrate the following procedures related to using the coping saw.

A. Installing the coping saw blade in the saw and adjusting the blade on its axis
B. Clamping material to a horizontal surface or in a vise
C. Using and controlling the vertical cutting stroke

SUPPORT MATERIAL

SPECIAL NOTES--

1. Refer to the quiz on Drilling, Cutting, and Shaping to be certain all questions related to the coping saw are covered.

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODES 7.10.1

ACTIVITY--Demonstrate Shaping with Surform, File, and Plane; and Shaping and Smoothing with Sandpaper

PURPOSE--To enable students to final-shape and smooth their metric dragster projects.

VOCABULARY--

Grit
File Tang
File Card
Wood Grain
Abrasive

PROCEDURE--

Acquaint students with the grain characteristics of wood, differentiating between grain direction, cross-grain, and end-grain.

Demonstrate the smooth and block planes, emphasizing the following.
A. Shaping flats and curves
B. Lateral and depth adjustments of blade
C. Consequences of cross-grain and end-grain planing

Demonstrate shaping with the surform tool.

Demonstrate the flat, half-round, and round files, emphasizing the following.
A. Proper stroking techniques
B. Need for a handle on the tang
C. Using a file card
D. Possible consequences of cross-grain and end-grain filing

Demonstrate the use of sandpaper for shaping and smoothing, emphasizing the following.
A. Sandpaper identification by grit side
B. Folding and tearing of sandpaper
C. Hand-held and block sanding techniques
D. Consequences of cross-grain sanding

SUPPORT MATERIAL

SPECIAL NOTES--

1. Refer to the quiz on Drilling, Cutting, and Shaping to be certain all questions related to shaping are covered.

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.11.1

ACTIVITY--Demonstrate/Orient Students to Learning Activity Packages (1 LAP)

PURPOSE--

1. To familiarize students with the LAP rotation schedule.
2. To enable students to perform the Screen Process Printing LAP.
3. To organize the students into groups for working on the LAP's.

VOCABULARY--

REFER TO THE SCREEN PROCESS PRINTING LAP

PROCEDURE--	SUPPORT MATERIAL
Use a graphic representation to show students the schedule for completing the Learning Activity Packages.	Refer to LAP Rotation Schedule
Instruct the students relative the Screen Process Printing LAP, emphasizing the following. A. Processes for preparing the printing frame and screen B. Processes for preparing the film C. Printing technique D. Industrial applications E. Career implications	Refer to Screen Process Printing LAP
Organize students into four balanced groups for completing the Learning Activity Packages.	

SPECIAL NOTES--

1. To maximize effective use of demonstration time, prepare in advance examples of each completed step in the process being demonstrated. This will eliminate the need to continue with completing the step after the important procedures in the step are demonstrated
2. Assign a due date for bringing in materials (shirts, etc.) on which to print. The due date should be in advance of the printing day so that those who forget will have another opportunity.
3. Provide paper to students who do not bring in materials on which to print.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.13.1

ACTIVITY--Demonstrate Sealing, Brush Painting, and Final Assembly of Metric Dragster Project

PURPOSE--To enable students to prime, finish, and assemble their metric dragster projects.

VOCABULARY--

NONE

PROCEDURE--

Use examples to contrast sealed and unsealed painted wood.

Demonstrate brush application of sealers and paints, emphasizing:
A. Opening and closing the container
B. Mixing
C. Brushing technique
D. Brush cleaning

Demonstrate final smoothing of sealers with abrasives.

Demonstrate preparing and installing axles, bearings, and wheels

SUPPORT MATERIAL

SPECIAL NOTES--

1. Spray painting of metric dragster projects is an option when: a) the facility has an approved ventilated spraying booth, or b) the spraying is done out of doors, or c) the spraying is done away from school.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.14.1

ACTIVITY--Demonstrate/Orient Students to Learning Activity Packages (2 LAP's)

PURPOSE--To enable students to perform the Plastics Forming LAP and the Career Investigation LAP.

VOCABULARY--

REFER TO THE PLASTICS FORMING AND THE CAREER INVESTIGATION LAP's.

PROCEDURE--	SUPPORT MATERIAL
Instruct the students relative the Plastics Forming LAP, emphasizing the following. A. Measuring and marking B. Finishing the edges (scraping, sanding, or buffing) C. Using the strip heater to fold the sheet acrylic D. Industrial applications E. Career implications	
Instruct the students relative the Career Investigation LAP, emphasizing the following. A. Sources of information in the school . Guidance Information System (G.I.S.) accessible through the computer terminal . Dictionary of Occupational Titles . Occupational Outlook Handbook B. Information to be completed on the Career Investigation Worksheet	Career Investigation Worksheet

SPECIAL NOTES--

1. Arrange with the Media Specialist and/or Guidance Department (according to which has the resources) to orient the students to the use of the career information resources.
2. Pre-cut on the table saw the sheet acrylic used in the Plastics Forming LAP.
3. To maximize effective use of demonstration time, prepare in advance examples of each completed step in the process being demonstrated. This will eliminate the need to continue with completing the step after important procedures in the step are demonstrated.

COURSE Industrial Arts Exploration 7 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.20.1

ACTIVITY--Summarize Course Implications for Career and Educational Planning

PURPOSE--

1. To relate for students the class experiences to high school offerings.
2. To correlate for students the high school offerings with careers.

VOCABULARY--

NONE

PROCEDURE--	SUPPORT MATERIAL
Relate the various course activities appropriately to high school courses in Drafting, Graphic Communications, and Manufacturing (woodworking, metalworking, and plastics)	Transparency: T-7.1.1-5
Relate the high school courses in Drafting, Graphic Communications, and Manufacturing to career opportunities.	Transparency: T-7.1.1-5 "Correlation of H.S.I.A. Courses with Occupational Titles in the D.O.T."

SPECIAL NOTES--

NONE

COURSE Industrial Arts Exploration 7 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 7.21.1

ACTIVITY--Flexible Day Activities

PURPOSE--Flexible days may be used:

1. To provide course enrichment which can be directed by a substitute in the teacher's absence.
2. To provide course enrichment directed by the teacher.
3. To compensate for class progress falling behind schedule.

VOCABULARY--

TO BE IDENTIFIED BY THE TEACHER.

PROCEDURE--	SUPPORT MATERIAL
Course enrichment lessons may include teacher demonstrations and/or student activities with career or consumer implications in the areas of communications and manufacturing.	
Substitute lesson plans and course enrichment lessons may include the use of audio-visual materials.	See listing below

"The World of Communications--
Visual Media" (Filmstrip with Tapes)
McKnight Publishing Co.

"Introduction to Manufacturing Careers"
(Filmstrips with Tapes, Transparencies)
McKnight Publishing Co.

SPECIAL NOTES--

NONE

COURSE Industrial Arts Exploration 7 COURSE NO.

6. LEARNING ACTIVITY PACKAGE ROTATION SCHEDULE

CODE	LEARNING ACTIVITY PACKAGE	QUANTITY
A	Screen Process Printing	2 per class
B	Plastics Forming	1
C	Career Investigation	N/A

Day	GROUPS 1	2	3	4
12	A	A	A	A
13				
14				
15	B		C	
16		B		C
17	C		B	
18		C		B

Teachers must organize a rotation schedule for the LAP's, as above. Each student will complete each LAP. The class should be divided into four balanced groups. An on-going activity (the Metric Dragster Project) will provide a purposeful activity in times between LAP's and after LAP's are completed.

COURSE Industrial Arts Exploration 7 COURSE NO.

7. STUDENT EVALUATION

CRITERIA--

Criterial for evaluating students must include the student's demonstration of skills and knowledge in meeting the nine (9) stated course objectives on page 4 of this guide. The stated objectives, in most cases, are sufficiently broad to allow the teacher to enumerate more specific lesson objectives. The lesson objectives will identify specific skills and knowledge which students will demonstrate. Demonstration of these skills and knowledge may be observed through student performance in one or more of the following, as appropriate: laboratory work, planning activities, worksheets, quizes, class discussion, and written assignments.

RECORDKEEPING--

Student performance in meeting cirteria for evaluating skills and knowledge must be documented. An example evaluation record is included in Appendix 7 of this guide.

8. APPENDIX

What's the Value to Me?

TRY SOME JOB ACTIVITIES--

find out what you may like and dislike

LEARN PRACTICAL SKILLS AND KNOWLEDGE--

- useful in many careers
- useful to consumers
- useful in recreation

Career Value of INDUSTRIAL ARTS

Industrial Arts helps to discover interests and abilities in many technical areas.

Careers which involve working with tools and materials are open to both man and woman.

The number of woman in technical careers is growing each year.

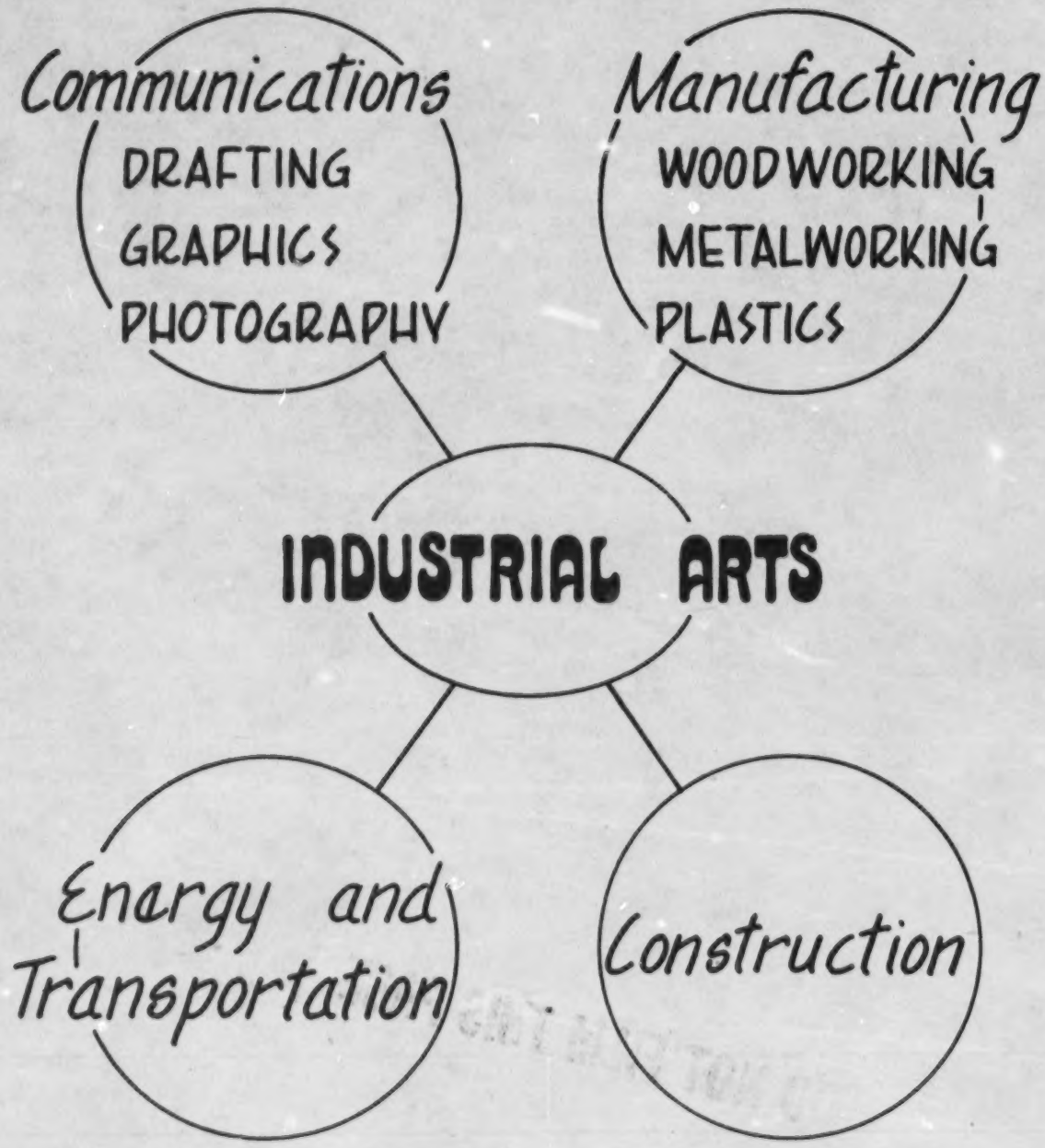
INDUSTRIAL ARTS

Consumer Value --

CONSUMERS WHO HAVE KNOWLEDGE AND ABILITY TO USE TOOLS AND MATERIALS ARE:

- BETTER JUDGES OF PRODUCT AND SERVICE QUALITY
- ABLE TO SAVE MONEY WITH "DO IT YOURSELF" PROJECTS
- MORE AWARE OF REQUIREMENTS FOR PRODUCT SERVICE AND MAINTENANCE

USE TOOLS AND MATERIALS TO DO HOME AND COMMUNITY PROJECTS FOR--

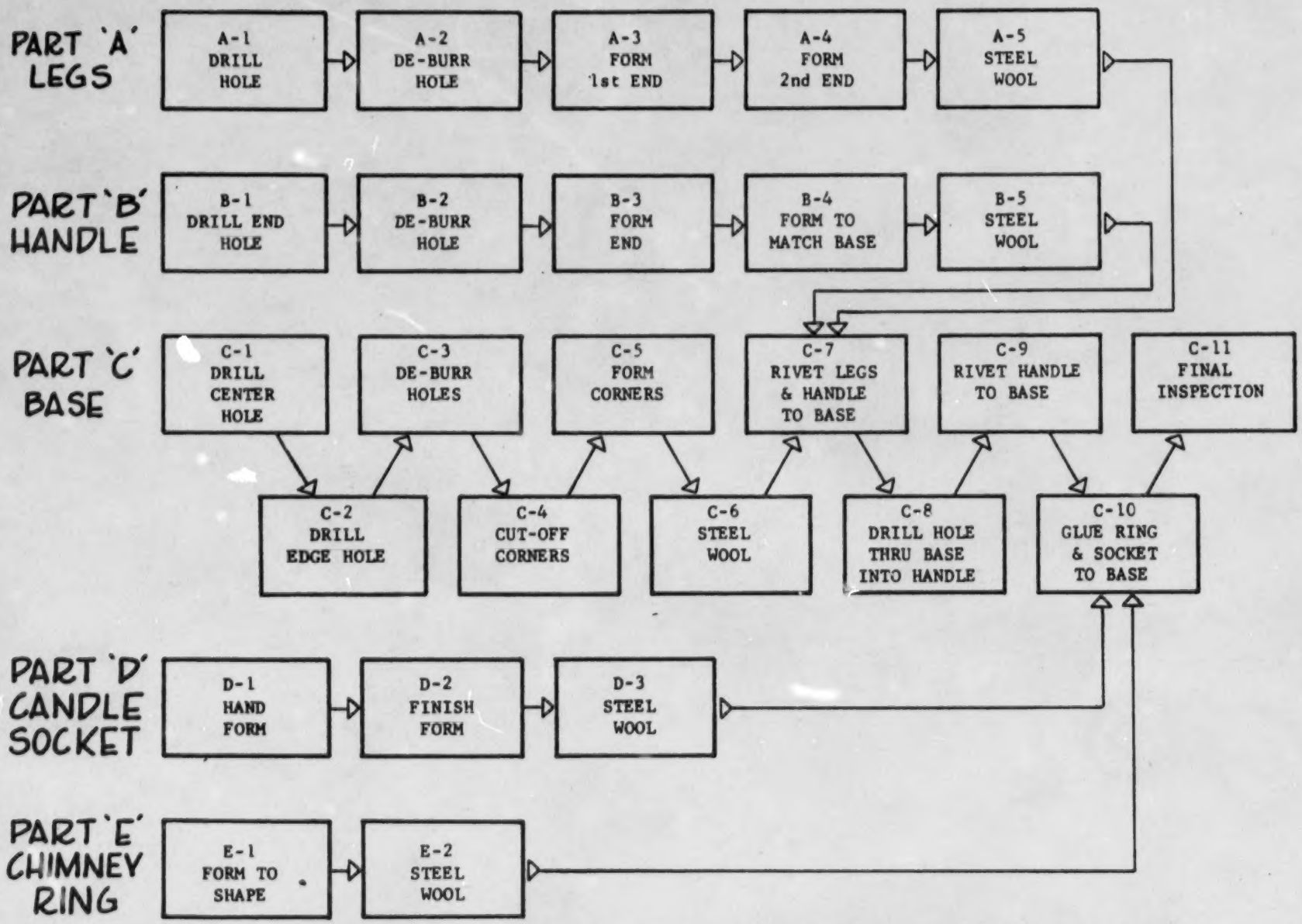

Communications
DRAFTING
GRAPHICS
PHOTOGRAPHY
Manufacturing
WOODWORKING
METALWORKING
PLASTICS
INDUSTRIAL ARTS
Energy and Transportation
Construction

SUCCESS

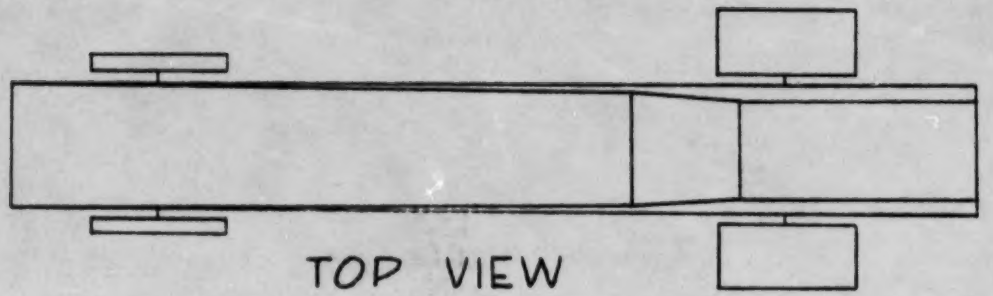
in Industrial Arts is:

- TRYING ALL THE TIME
- USING TOOLS AND MATERIALS CAREFULLY
- USING TIME WISELY
- WORKING COOPERATIVELY TOGETHER

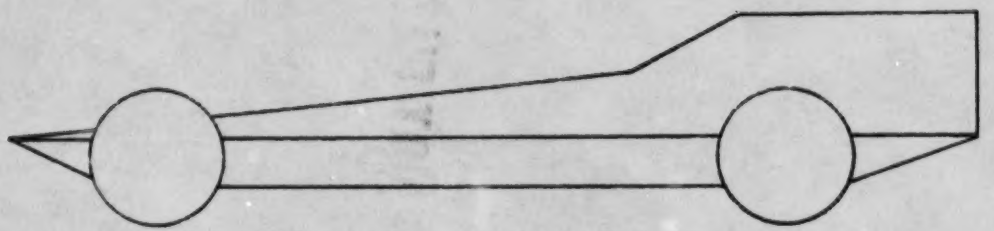
HURRICANE LAMP PRODUCTION FLOW CHART



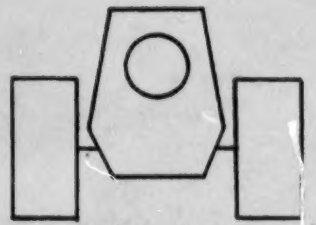
T-7.2.2-1



TOP VIEW

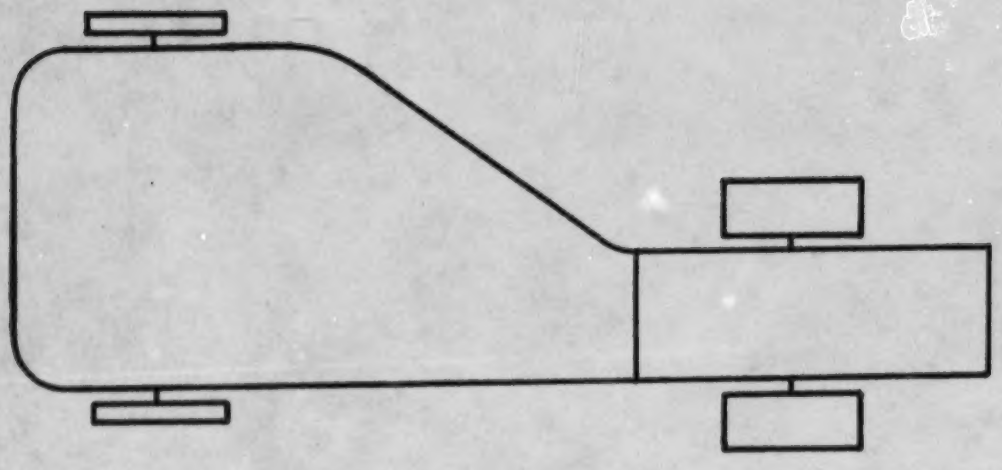


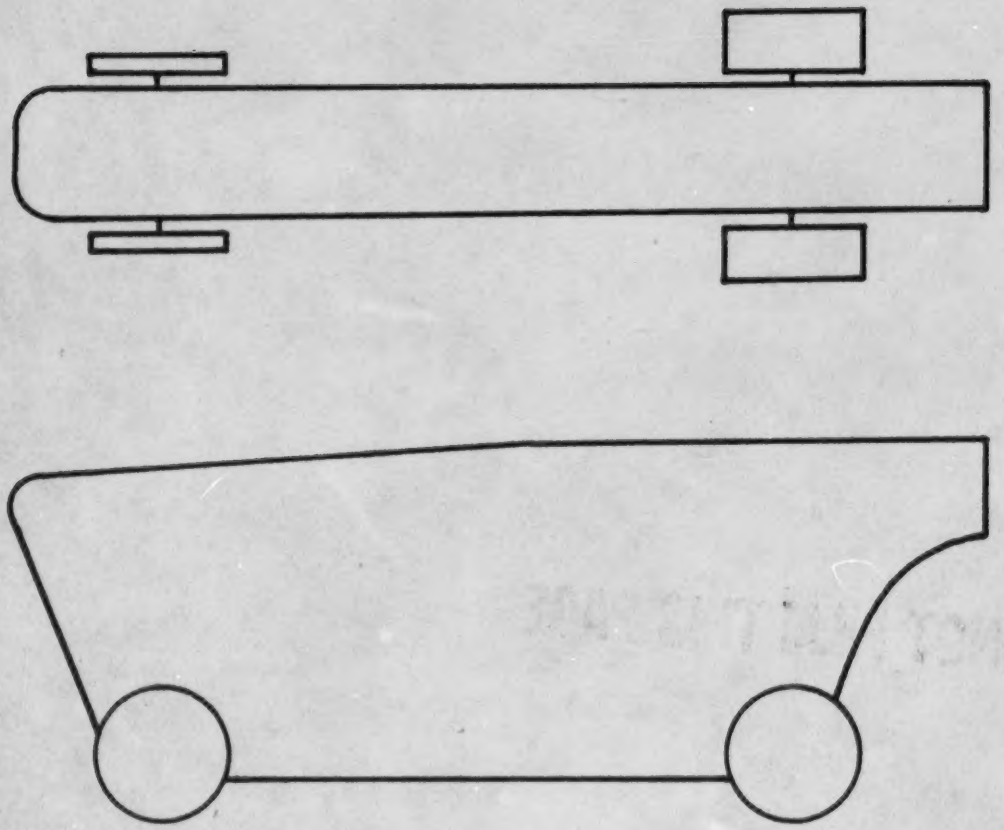
FRONT VIEW

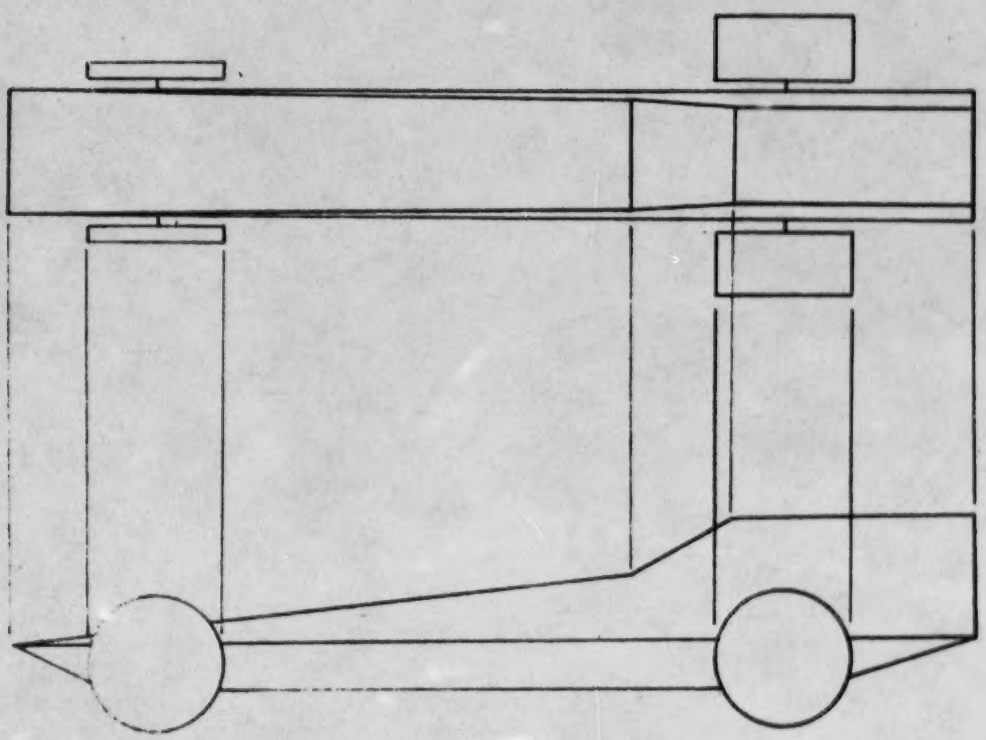


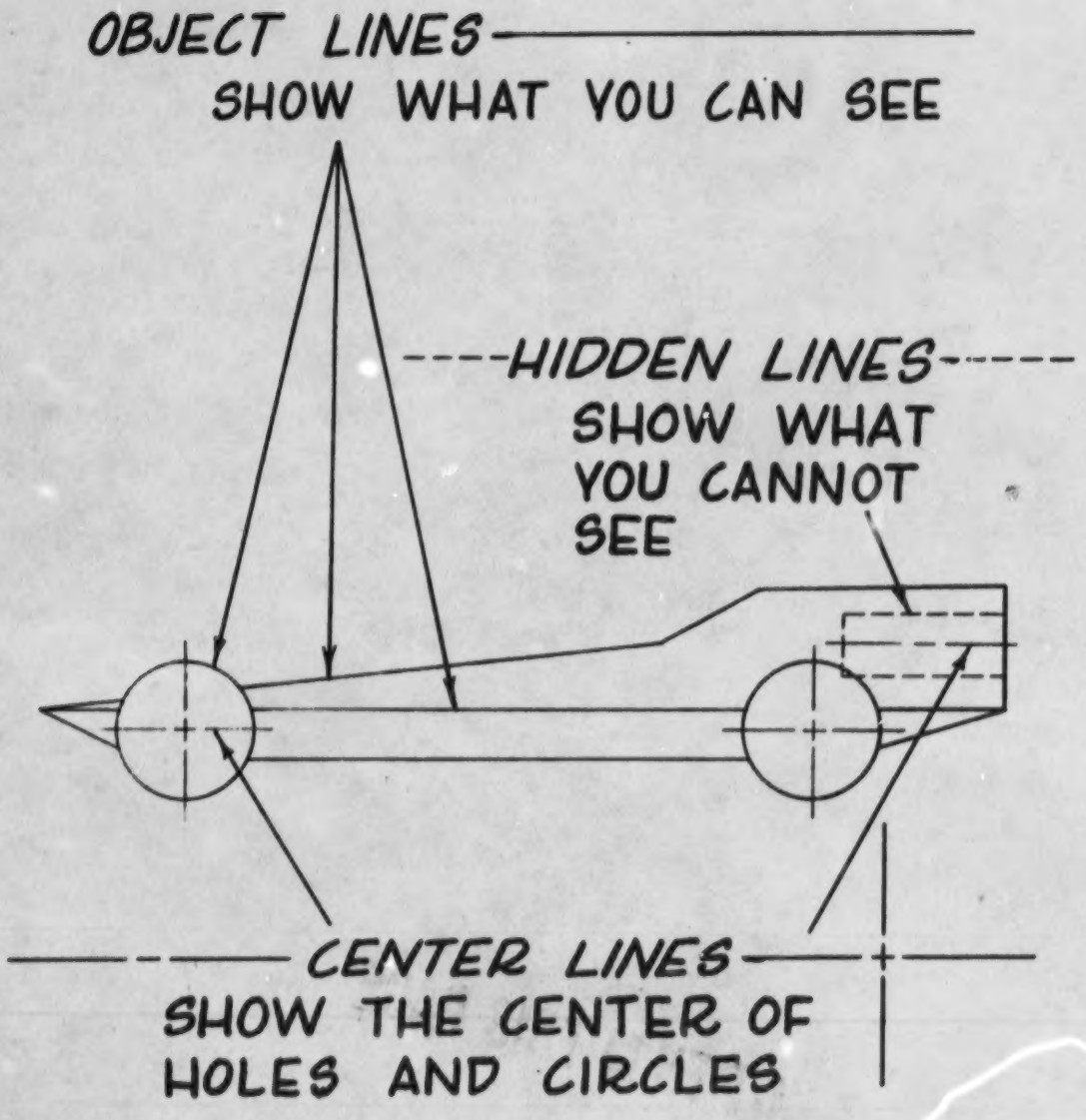
RIGHT SIDE VIEW

T-7.5.2-1








OBJECT LINES
SHOW WHAT YOU CAN SEE
HIDDEN LINES
SHOW WHAT YOU CANNOT SEE
CENTER LINES
SHOW THE CENTER OF HOLES AND CIRCLES

A
Good Design
Has

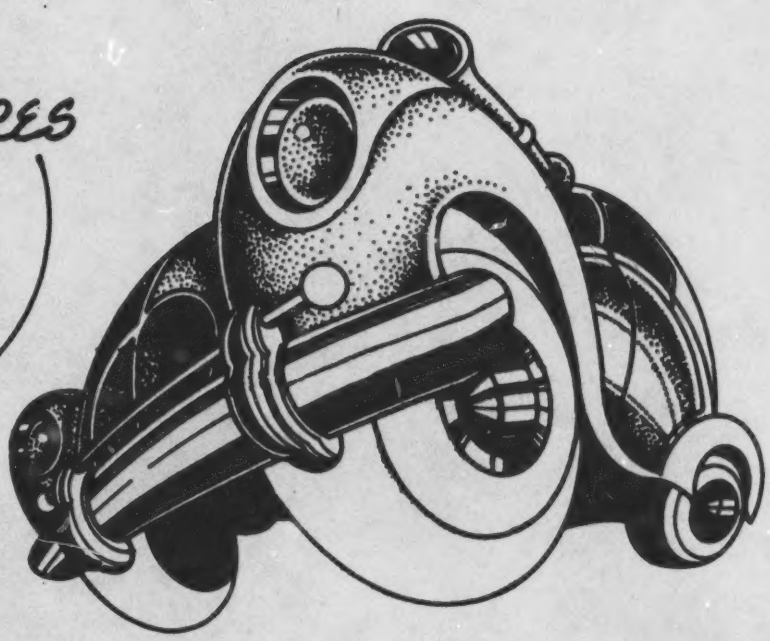
— NICE APPEARANCE

— FUNCTION--
IT WORKS WELL

— PRACTICALITY

13

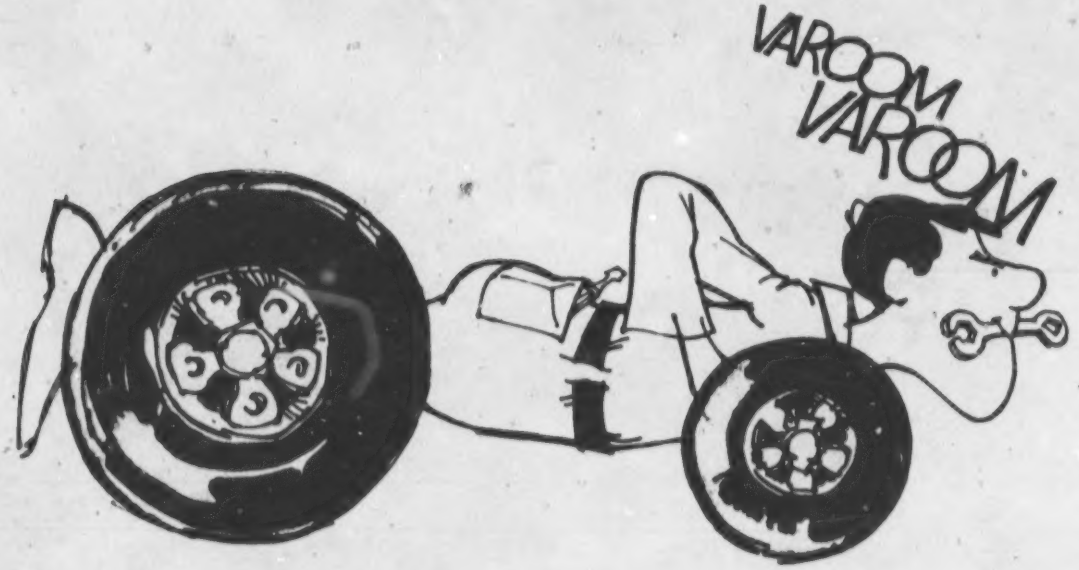
What Makes It Look Good?



- **Proportion** - RELATIONSHIP OF PARTS TO EACH OTHER
- **Balance** - PROPER SPREAD OF WEIGHT
- **Harmony** - THE PARTS BLEND
- **Emphasis** - CATCHING THE EYE

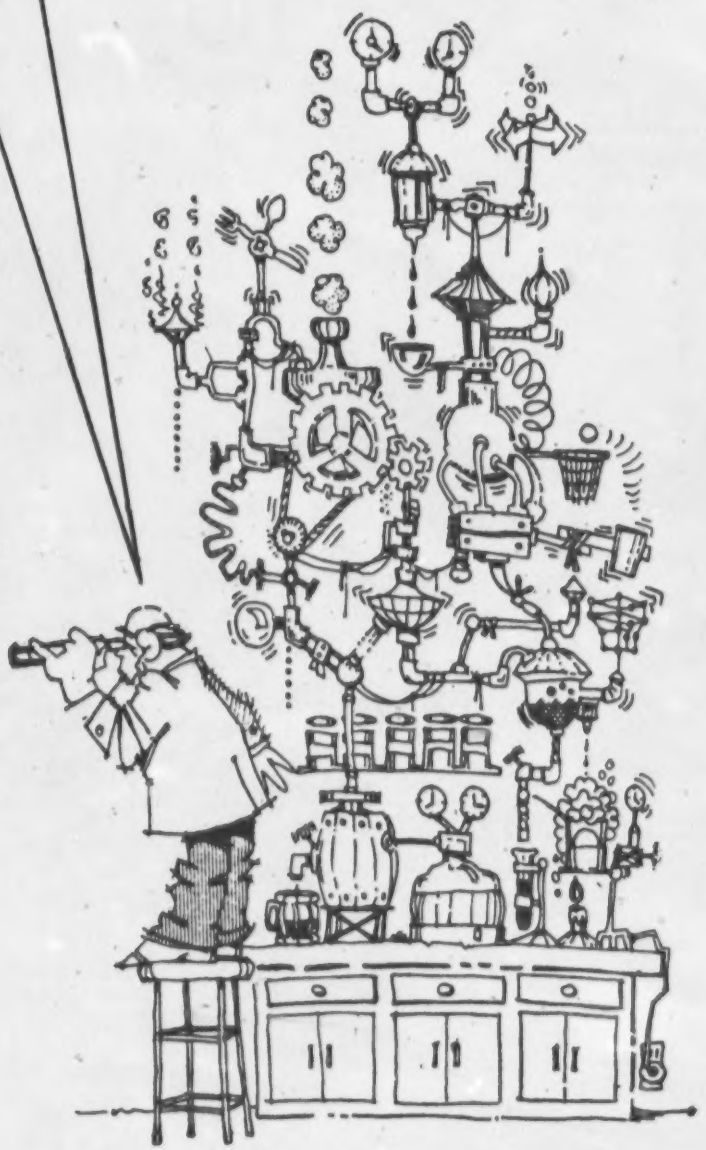
A RACER THAT FUNCTIONS WELL IS

FAST
SAFE
RELIABLE



15

I WISH I KNEW WHAT A PRACTICAL DESIGN WAS BEFORE I STARTED!!



PRACTICAL DESIGNS CAN BE *PRODUCED* AND *MAINTAINED* WITH AVAILABLE

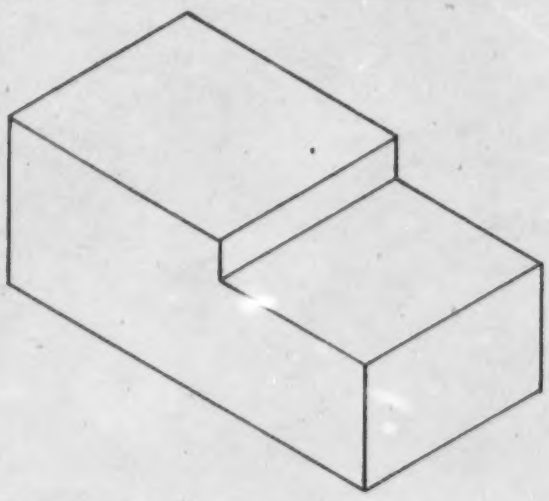
time
materials
labor
equipment
money

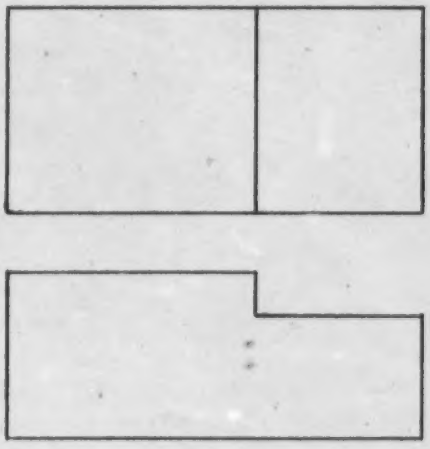
NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION 7

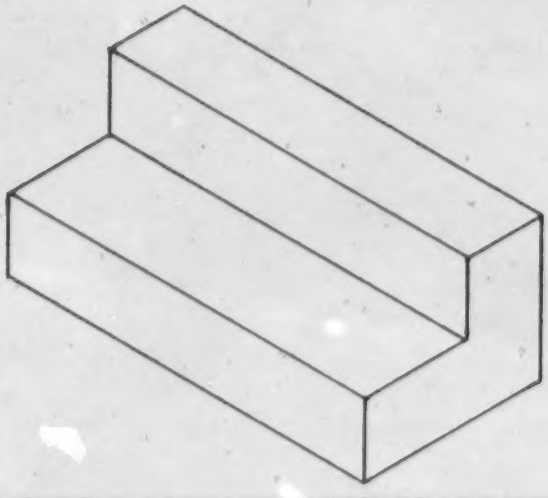
Sketching Worksheet

EXAMPLE

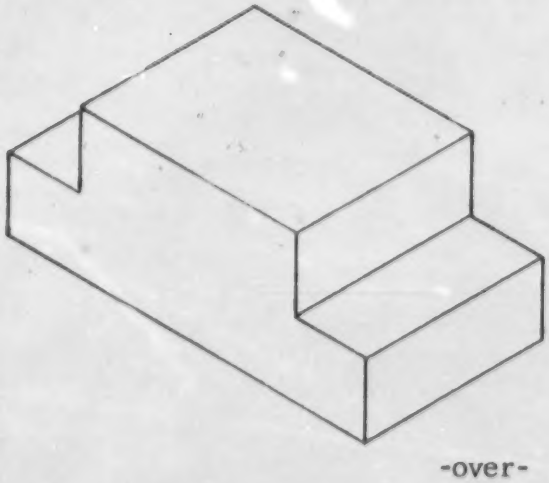


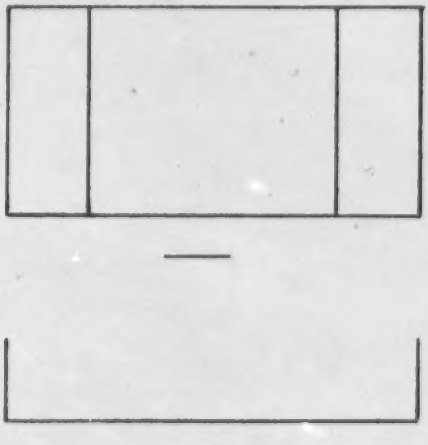


PROBLEM 1



PROBLEM 2





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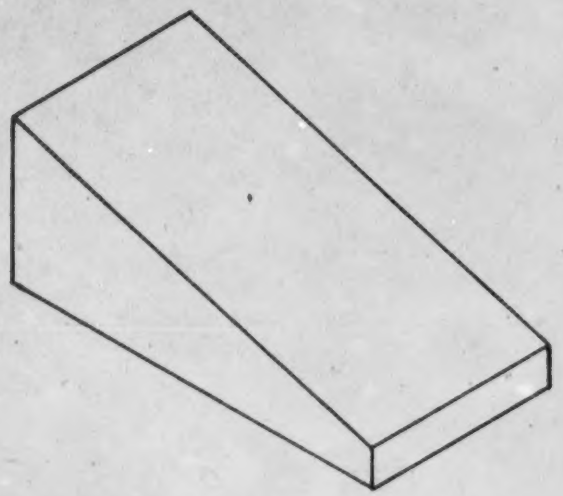
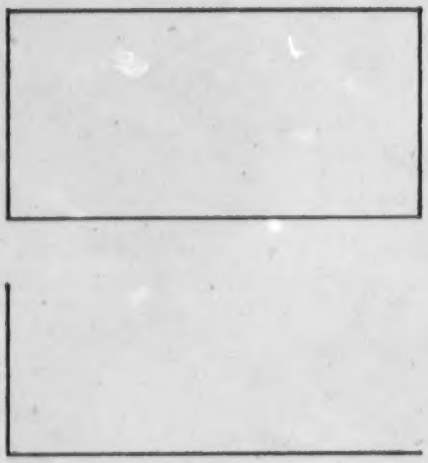
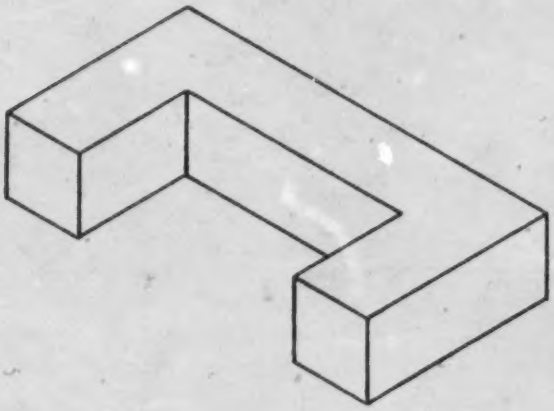
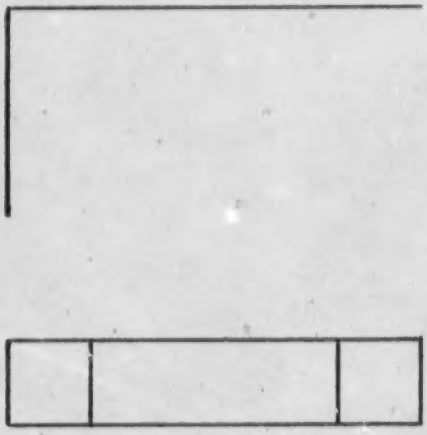
PROBLEM 3



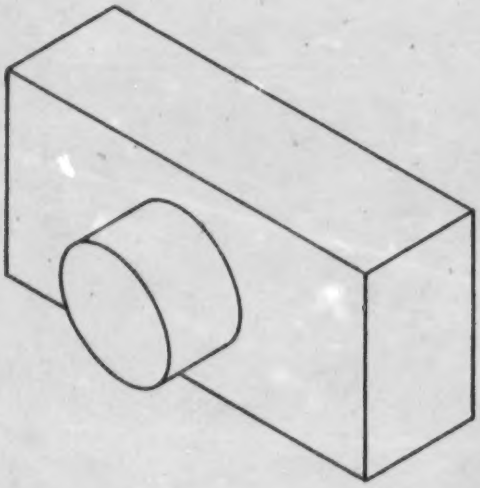


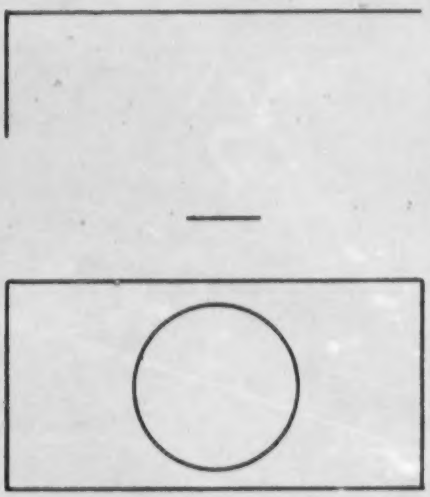
PROBLEM 4





PROBLEM 5





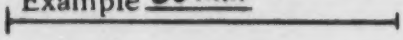
NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION 7

Metric Measuring Exercise

Use your metric ruler to measure the lines below. Write the length in millimeters (mm) in the space beside each letter

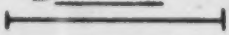
Example 85mm

Example 60mm 

A_____

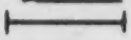
B_____

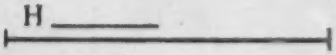
C_____

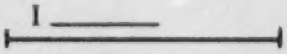
D_____ 

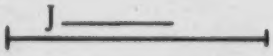
E_____

F_____

G_____ 

H_____ 

I_____ 

J_____ 

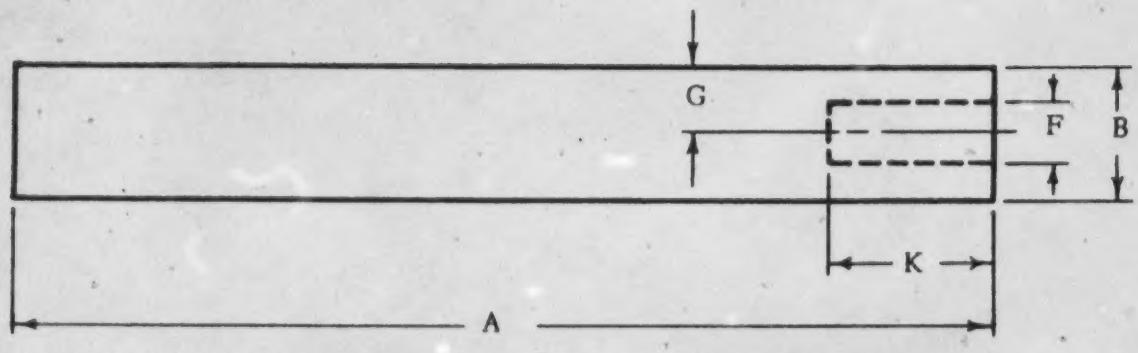
Draw the lines listed below. Begin at the dot (•)

1. 40 mm •
2. 65 mm •
3. 35 mm •
4. 10 mm •
5. 20 mm •
6. 50 mm •
7. 100 mm •
8. 90 mm •
9. 75 mm •
10. 45 mm •

NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION 7

METRIC DRAGSTER SPECIFICATION SHEET



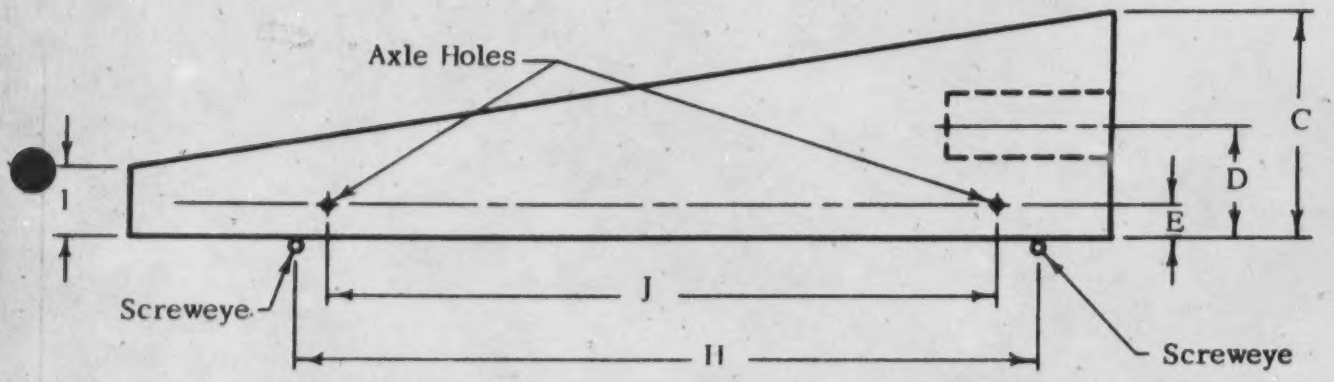


TABLE OF MEASUREMENTS

A	200-300mm	G	20mm
B	40mm	H	155mm or more
C	70mm	I	20mm
D	35mm	J	105-270mm
E	10mm	K	50mm
F	20mm		

BILL OF MATERIALS

PART NAME	NUMBER REQUIRED
Wheel, Rear	2
Wheel, Front	2
Washer	4
Screweye	2
Axle	2
Bearing	2
Body	1

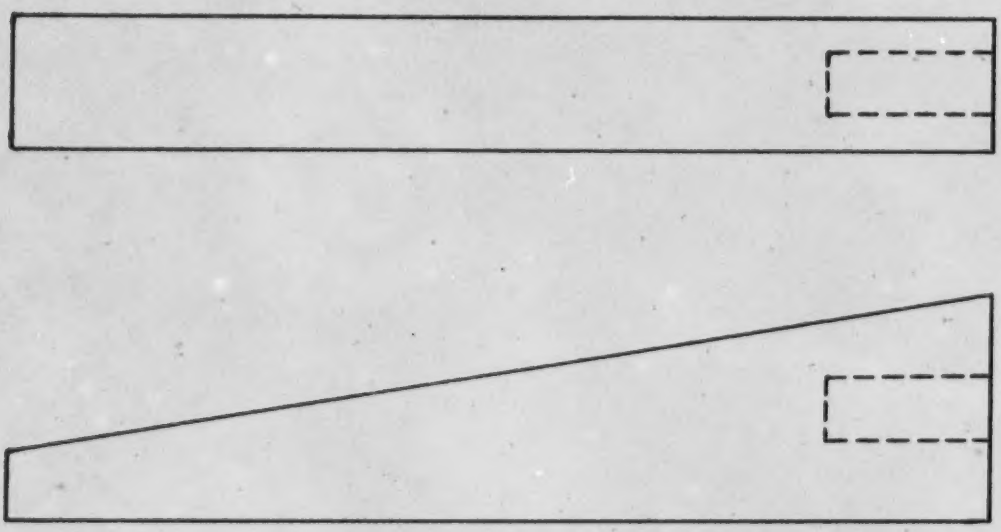
NOTE: Wheels must not extend beyond the front and back of the car body.

20

NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION 7

METRIC DRAGSTER DESIGN WORKSHEET



DESIGN NO. 1

DESIGN NO. 2

OCCUPATION_____ NAME_____

DATE_____

PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
INDUSTRIAL ARTS CAREER INVESTIGATION
WORKSHEET

1. What level of schooling is required for this occupation? Check (✓) below.

   _____ a. High School
   _____ b. Trade/Vocational School
   _____ c. Junior or 2-Year College
   _____ d. College Degree
   _____ e. Graduate Degree

2. What courses could you take now or before graduating from high school that would help prepare you for this occupation? List below.

   _____
   _____
   _____
   _____
   _____
   _____

3. Are any of the following required for this occupation? Check (✓) below.

   _____ a. On-the-job experience
   _____ b. Apprenticeship
   _____ c. Internship
   _____ d. State License

4. What does a person do in this occupation? List 3 or 4 specific duties or skills required.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

5. What skills do you now have that would help you in this type of work? List below.

   _____
   _____
   _____
   _____
   _____
   _____

6. Does the work of this occupation require more mental skill, or more physical skill? Check (✓) below.

   _____ a. Requires more mental skill
   _____ b. Requires more physcial skill
   _____ c. Requires about the same amount of mental and physical skill

7. What earnings does a person starting in this occupation usually get? Check (✓) below.

   _____ a. Under $5,000 per year
   _____ b. Between $5,000 and $10,000
   _____ c. Between $10,000 and $20,000
   _____ d. Over $20,000

8. What earnings does a person with several years experience get in this occupation? Check (✓) below.

   _____ a. Under $5,000 per year
   _____ b. Between $5,000 and $10,000
   _____ c. Between $10,000 and $20,000
   _____ d. Over $20,000

9. Are there many openings for new people in this occupation? Check (✓) below.

   _____ a. Yes, but not for long
   _____ b. Not at the present time
   _____ c. Many openings in the future

10. How would you describe the physical activities of this occupation? Check (✓) below.

    _____ a. Strenuous
    _____ b. Moderate (Medium)
    _____ c. Light

11. What parts of this job do you like and dislike? List below.

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION

General Safety Quiz

Circle T for True or F for False beside each sentence.

T F 1. If you see something that is unsafe, you should tell the teacher right away.
T F 2. Only serious accidents need to be reported to the teacher.
T F 3. Safety goggles are needed only when you are operating a machine.
T F 4. Loose sleeves should be rolled up when you use machines.
T F 5. Carry sharp or pointed tools facing down and away from others.
T F 6. The machine operator is the only person who should turn on the machine.
T F 7. The safety zone is a safe place to watch other people work.
T F 8. Never bother or talk to a machine operator.
T F 9. You should run in the shop to save time.
T F 10. Never throw objects in the shop.

Multiple Choice - Circle the Letter before the best choice to complete the sentence.

11. Loose Clothing should be:
    a. worn as it is
    b. returned to lost and found
    c. removed or corrected
    d. none of the above

12. Shoes that are worn in the shop should be:
    a. sandals
    b. shower clogs
    c. worn with shoelaces untied
    d. closed at both heel and toe

13. The hazard of long hair could be fixed by a
    a. hair net
    b. rubber band
    c. head band
    d. all of the above

14. Rings, medallions or any dangling jewelry should be:
    a. polished and buffed
    b. removed and put away
    c. held in one hand while working
    d. left on tables at your assigned seat

15. When handling large, heavy or bulky items you should:
    a. do it alone to avoid confusion
    b. get someone to help you
    c. use your back muscles
    d. make sure you wear a face shield

16. Posted rules on each machine are:
    a. reminders in case you are unsure of yourself
    b. for your protection
    c. to be followed at all times
    d. all of the above

17. Use only equipment:
    a. the teacher permits you to use
    b. the teacher has demonstrated to you
    c. you know how to use
    d. all the above

18. Tools and equipment should be used:
    a. when permitted by the teacher
    b. at any time you desire
    c. during roll call
    d. during clean up

19. If you have an accident, no matter how small, you should:
    a. go to the health aide on your own
    b. wash it
    c. report it to the class foreman
    d. report it to the teacher immediately

20. When uncertain about proper and safe procedures to follow, you should:
    a. ask the principal
    b. ask the teacher
    c. put on goggles and proceed
    d. sit down and do your homework

NAME_____TEAM_____DAY_____DATE_____

INDUSTRIAL ARTS EXPLORATION 7

SAFETY TEST--DRILLING, CUTTING AND SHAPING

INSTRUCTIONS: Circle the correct answer, T for true, F for false.

T F 1. It is safe to use only your hand to hold your project when drilling on the drill press.

T F 2. A face shield must be worn when drilling on the drill press.

T F 3. The drill press chuck key should be left in the chuck at all times.

T F 4. The moving parts of a machine should never be touched with your hands.

T F 5. When cutting on the jig saw, fingers should be kept away from the cutting line.

T F 6. Before turning on the jig saw, the machine should be rotated one full stroke by hand.

T F 7. When using the jig saw, the pressure foot should be adjusted 1/16" above the work piece.

T F 8. Sawing in the direction of the wood grain is called ripping or rip sawing.

T F 9. You should not back out of a long cut on the jig saw.

T F 10. A face shield is not required when using the jig saw because it is a very safe machine to use.

T F 11. The blade of the coping saw is installed with the teeth pointing back toward the handle.

T F 12. The coping saw is made to cut on the push stroke.

T F 13. A file handle is installed for appearance and has no other function.

T F 14. Your hand can be used to remove excess wood from the teeth of a file.

T F 15. Files and surform tools cut on the push stroke.

T F 16. A wood plane cannot be adjusted in any way.

T F 17. The wood plane cuts on the forward stroke only.

T F 18. To be used safely, sandpaper must be backed-up with a block of wood.

T F 19. All machines in the shop can be used without your instructor's permission.

T F 20. If any power machine develops problems while it is running, you should try to figure out the problem and then turn it off.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

1. COURSE DESCRIPTION

Students in this course will be introduced to the Industrial Arts areas of "Energy and Transportation" and "Construction." Students will use tools and materials in a series of career exploration activities in these areas. The activities will also develop skills and knowledge with practical and leisure time applications.

2. COURSE OBJECTIVES

Students will demonstrate ability to:

- assist in disassembling, analyzing, and assembling a small gasoline engine.
- use tools and materials to construct a small wood framed building.
- use tools and materials for masonry construction.
- install and repair simple electrical wiring.
- install and repair piping and common plumbing fixtures.
- install and repair drywall wall covering.
- install door hardware.
- install a replacement window pane.
- use career information resources to investigate an occupation.

In achieving the above objectives, students will perform at least the following "Project Basic" competencies:

- Follow textbook instruction.
- Understand caution and warning signs.
- Follow step-by-step directions for emergencies.
- Follow step-by-step directions to complete a school or job assignment.
- Follow step-by-step directions for putting together a "do-it-yourself" kit.
- Use directions to follow a pattern.
- Follow step-by-step directions for appliance use.
- Spot key words necessary for getting information at school, work, and living in society.
- Get necessary information for the home from consumer information and government pamphlets.
- Fill out school forms and application forms.
- Write lists.
- Take notes from spoken or written materials.
- Write a sentence that makes a statement.
- Write two or more related sentences on a single topic or idea.
- Write a paragraph in response to a question.
- Write a paragraph to summarize ideas read or heard.
- Add, subtract, multiply, and divide whole numbers.
- Add and subtract mixed numbers.
- Read scales on measuring instruments.
- Use information from tables and graphs.
- Choose an appropriate unit of measure.
- Demonstrate safety practices.
- Identify ways to enter the world of work.
- Identify skills, knowledge, and training required for major types of jobs.
- Identify school subjects which help develop skills, knowledge, and training for different jobs.
- Identify basic requirements for getting certain jobs.
- Identify jobs that interest you.
- Identify qualities employers look for in job applicants.
- Describe behavior that is appropriate for a particular work situation.
- Describe the importance of time in a particular work setting.
- List some of your personal characteristics based on school work, test results, and nonschool activities.
- Identify educational opportunities available in selected careers.
- Identify ways of selecting programs, schools, and courses which help prepare you for a job.
- Use school and community resources to obtain career information.
- Participate in introductory recreational activities.

COURSE Industrial Arts Exploration 8 COURSE NO.

3. INSTRUCTIONAL STRATEGIES AND RESOURCES

OBJECTIVE--STUDENTS WILL:	INSTRUCTIONAL STRATEGY	RESOURCES
Participate In Disassembling, Analyzing And Assembling A Small Gasoline Engine	. Teacher Discusses Theory Of 4-Cycle Engine . Students Assist Teacher In Disassembling, Analysis, And Assembly Of Small Gasoline Engine	"Small Gasoline Engine: Theory And Operation--Four Cycle" (Moduline 35, Cardinal Associates, Inc.) Unit #3003 "Small Gasoline Engine: Disassembly" Unit #3001 "Small Gasoline Engine: Assembly" Unit #3002
Use Tools And Materials To Construct A Small Wood Framed Building	. Teacher Instructs And Demonstrates Tools And Procedures For Wood Frame Construction . Students Work In Groups Of 5, Each With Specific Assignments, To Produce A Scaled Frame Building	"Industrial Arts Framing Construction Activity", Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976
Use Tools And Materials For Masonry Construction	. Teacher Instructs And Demonstrates Tools And Procedures For "Bricklaying" LAP Or "Concrete" LAP . Students Work In Pairs To Complete The "Bricklaying" LAP Or "Concrete" LAP	"Bricklaying" (Learning Activity Package), Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976 Home Repair And Improvement: Masonry, Time/Life Books, 1976
Install And Repair Simple Electrical Wiring	. Teacher Instructs And Demonstrates Tools And Procedures For "Electrical Wiring And Repair" LAP . Students Work In Pairs To Complete The "Electrical Wiring And Repair" LAP	"Electrical Wiring And Repair" (Learning Activity Package), Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976 Home Repair And Improvement: Basic Wiring, Time/Life Books, 1976
Install And Repair Piping And Common Plumbing Fixtures	. Teacher Instructs And Demonstrates Tools And Procedures For "Copper Tubing Installation And Repair" LAP . Teacher Instructs And Demonstrates Tools And Procedures For "Faucet Repair" LAP . Students Work In Pairs To Complete Each Plumbing LAP	"Copper Tubing Installation And Repair" (Learning Activity Package), Prince George's County Public Schools "Faucet Repair" (Learning Activity Package), Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976 Home Repair And Improvement: Plumbing, Time/Life Books, 1976
Install And Repair Drywall Wall Covering	. Teacher Instructs And Demonstrates Tools And Procedures For Installing, Finishing And Patching Drywall . Students Work In Pairs To Complete The "Drywall Installation And Repair" LAP	"Drywall Installation And Repair" (Learning Activity Package), Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976
Install Door Hardware	. Teacher Instructs And Demonstrates Tools And Procedures For Installing A Butt Hinge And Lock Set . Students Work In Pairs To Complete The "Door Hardware Replacement" LAP	"Door Hardware Replacement" (Learning Activity Package), Prince George's County Public Schools Betts, Fannin, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976

COURSE Industrial Arts Exploration 8 COURSE NO.

3. INSTRUCTIONAL STRATEGIES AND RESOURCES

OBJECTIVE--STUDENTS WILL:	INSTRUCTIONAL STRATEGY	RESOURCES
Install A Replacement Window Pane	. Teacher Instructs And Demonstrates Tools And Procedures For Installing A Replacement Window Pane . Students Work In Pairs To Complete The "Window Pane Installation And Repair" LAP	"Window Pane Installation And Repair" (Learning Activity Package) Prince George's County Public Schools Betts, Fr[illegible]min, Hauenstein, Exploring The Construction Industry, McKnight Publishing Co., 1976
Use Career Information Resources To Investigate An Occupation	. Teacher Explains Activity Requirements . Teacher Or Media Specialist Demonstrates Use Of Appropriate Resources . Students Individually Select An Appropriate Occupation, Investigate Using Available Resources, And Prepare Reports	Guidance Information System (G.I.S. Retrieved From Computer Terminal) U.S. Department Of Labor, Dictionar Of Occupational Titles, 1977 U.S. Department Of Labor, Occupatic Outlook Handbook, Bi-annual

COURSE Industrial Arts Exploration 8 COURSE NO. _____

4. PLAN OF TEACHER DIRECTION AND STUDENT PARTICIPATION

DAY	NOTES CODE	TEACHER ACTIVITY	STUDENT ACTIVITY
1	8.1.1	Introduce Students to Industrial Arts and Class Activity	Listen and Observe
		Orient Students to the Class Management (Class Rules, Procedures, and Grading)	Listen and Observe
		Assign Seats	
		Discuss General Safety Rules	Listen and Discuss
2		Assign Lockers and Safety Glasses	
		Administer Quiz -- on General Safety Rules	Take Quiz
	8.2.1	Orient Students to Scaled Framing Project -- Plan Reading, Measuring, Laying-out	Listen and Observe
3		Organize Project Groups	
	8.3.1	Demonstrate Cross-cutting (Band Saw, Crosscut Saw, Back Saw, Miter Box)	Listen and Observe
	8.3.2	Demonstrate Nailing	Listen and Observe
		Administer Quiz -- on Crosscutting and Nailing	Take Quiz
4		Review Quiz on General Safety Rules	Listen and Discuss
		Review Quiz on Crosscutting and Nailing	Listen and Discuss
		Organize cleanup system	
		Observe and Assist Students	Work on Framing Projects
5	8.5.1	Demonstrate/Orient Students to LAPS	Listen and Observe
		Observe and Assist Students	Work on Framing Projects
6	8.5.1	Demonstrate/Orient Students to LAPS	Listen and Observe
		Observe and Assist Students	Work on Framing Projects
7	8.5.1	Demonstrate/Orient Students to LAPS	Listen and Observe
		Observe and Assist Students	Work on Framing Projects
8		Observe and Assist Students	Work on LAPS/Framing Projects
9		Observe and Assist Students	Work on LAPS/Framing Projects
10		Observe and Assist Students	Work on LAPS/Framing Projects
	8.10.1	Demonstrate Cutting and Assembly of Roof Trusses	Listen and Observe in Small Groups
11		Observe and Assist Students	Work on LAPS/Framing Projects
12		Observe and Assist Students	Work on LAPS/Framing Projects
	8.10.1	Demonstrate Cutting and Assembly of Roof Trusses	Listen and Observe in Small Groups

COURSE Industrial Arts Exploration 8 COURSE NO. _____

PLAN OF TEACHER DIRECTION AND STUDENT PARTICIPATION

DAY	NOTES CODE	TEACHER ACTIVITY	STUDENT ACTIVITY
13		Observe and Assist Students	Work on LAPS/Framing Projects
14	8.10.1	Observe and Assist Students Demonstrate Cutting and Assembly of Roof Trusses	Work on LAPS/Framing Projects Listen and Observe in Small Groups
15		Observe and Assist Students	Work on LAPS/Framing Projects
16	8.10.1	Observe and Assist Students Demonstrate Cutting and Assembly of Roof Trusses	Work on LAPS/Framing Projects Listen and Observe in Small Groups
17	8.17.1	Demonstrate Building Assembly Observe and Assist Students	Listen and Observe Work on Framing Projects
		Observe and Assist Students	Work on Framing Projects
19	8.19.1	Demonstrate and Discuss Theory of 4-Cycle Gasoline Engine Mechanics	Listen, Observe and Participate
20	8.20.1	Summarize Course Implications for Career and Education Planning Cleanup and Check Out	Listen and Discuss Participate as Necessary
21	8.21.1	Flexible Day	Participate as Necessary
22	8.21.1	Flexible Day	Participate as Necessary

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.1.1

ACTIVITY--Introduce students to Industrial Arts and Class Activities

PURPOSE--To familiarize students with the Industrial Arts program and the activities for the class.

VOCABULARY--

None

PROCEDURE--	SUPPORT MATERIAL
Discuss the following questions.	
A. What's the value to me?	Transparency: T-8.1.1-1
. Try some job activities to find out what you may like and dislike.	
. Learn practical skills and knowledge that are useful-	
-in many careers	Transparency: T-8.1.1-2
-to consumers	Transparency: T-8.1.1-3
-in recreation	Transparency: T-8.1.1-4
B. What are we going to do?	
. Explore the major areas of Industrial Arts by working with tools and materials.	Transparency: T-8.1.1-5
-highlight the two areas for this grade	Transparency: T-8.1.1-5
-identify projects, LAPS, tools, and equipment	Use examples and/or slides
C. How can I be successful in Industrial Arts?	Transparency: T-8.1.1-6
. Not a result of previous experience, but a result of trying all the time.	
. Not a result of physical strength, but a result of careful use of tools and materials.	
. Not a result of being able to work fast, but a result of using time wisely.	
. Not a result of competing with others, but a result of working cooperatively together.	

SPECIAL NOTES--

None

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.2.1

ACTIVITY--Orient Students to Scaled Framing Project

PURPOSE--To enable students to:

1. read scaled framing activity plans.
2. measure and layout scaled framing members.

VOCABULARY--

Stud	Sole Plate	Spacer Block
Cripple Stud	Rafter Plate	Framing
Trimmer Stud	Truss	Scale/Scaled
Header	Joist	
Sill	Bridging	

PROCEDURE--	SUPPORT MATERIAL
Show and describe to the students an example and/or the pictorial assembly drawing of a completed scaled framing project.	Drawing 1 of 7 for I.A. Framing Construction Activity
Explain individual responsibilities in the group project (see Special Notes below).	
Select two wall detail drawings (1 with a window and 1 with a door) and the floor joist detail. Use transparencies of the selected detail drawings to demonstrate how to read the plans.	Drawings 2-5 for I.A. Framing Construction Activity
A. Make correlations between parts of the drawings and the completed project example. B. Emphasize nomenclature of the framing members. C. Emphasize interpretation of dimensioning symbols.	
Demonstrate laying out a top (rafter) plate and a bottom (sole) plate following a wall detail drawing and using a rule and square.	Drawings 2-5 for I.A. Framing Construction Activity
Discuss with students the relationship of their scaled project with: . full scale framing . full scale decking and sheathing . the type of work done by carpenters	

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.2.1 (continued)

SPECIAL NOTES--

1. Post the exploded assembly drawing (Number 1 of 7) on a bulletin board. You may wish to post the other drawings on a bulletin board, also.
2. Assign up to five (5) students to work as a group on the project. Individual responsibilities in the group may be as follows:

   . Student A--frame the floor joists and apply plywood decking
   . Student B--frame the front wall
   . Student C--frame a side wall
   . Student D--frame a side wall
   . Student E--frame a rear wall

   Each student will fabricate a truss and participate in the overall assembly and finishing of the project.
3. Select one student to be construction foreman for each scaled framing project. The foreman should check the work of the group members for accuracy and quality. (See Construction Foreman's Checklist in Appendix 8.) If class size makes it desirable to form a group of six (6) students, take responsibility for constructing a structure member away from the foreman and allow the foreman to actively assist other group members.
4. Provide an example of the project for students to examine. (This will be of assistance to students and should help with motivation.) You may wish to label the framing members on the sample project to assist students in developing the correct vocabulary.
5. You may wish to give each student the drawing detail for their construction responsibility. Use the drawings and the sample project to instruct students in proper framing procedures.
6. The teacher should use a table saw to pre-rip for students the scaled framing materials.
7. Use 1" brads or wire nails for framing, decking, and sheathing.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.3.1

ACTIVITY--Demonstrate Cross-cutting

PURPOSE--

1. To enable students to cross-cut framing materials.

VOCABULARY--

Miter Gauge
Square
Right Angle

PROCEDURE--

Explain to students the importance of square cuts when cutting framing members.

Demonstrate cross-cutting using the cross-cut handsaw, backsaw (free-hand and with a miter box) emphasizing the following:

A. Holding materials with a wood vise, hand-screw clamp, and miter box
B. Using a line as a guide
C. Starting the cut
D. Sawing stroke and angle
E. Completing the cut

Demonstrate cross-cutting with the bandsaw emphasizing the following:

A. Holding material with the miter gauge
B. Using a line as a guide
C. Position of both hands and body while cutting
D. Safe material feed-rate
E. Safe after-cutting procedures

Review the posted rules for the bandsaw as appropriate to cross-cutting with the miter gauge.

SUPPORT MATERIALS

SPECIAL NOTES--

1. Emphasize that students must have teacher permission before using the bandsaw each time.
2. Emphasize that student use of the bandsaw will be limited to cross-cutting with the miter gauge.
3. Point out that students should not plan to do all of their framing material cutting on the bandsaw because a) other sawing experiences are valuable, and b) time lost waiting in line will be costly.

COURSE Industrial Arts Exploration 8 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.3.2

ACTIVITY--Demonstrate Nailing

PURPOSE--

1. To enable students to assemble by nailing the framing members of the scaled framing project.

VOCABULARY--

Wire Nail
Common Nail
Toe Nail
Driving

PROCEDURE--

Display for students examples of sizes of common nails typically used in wood frame construction.

Show the students the wire nails to be used in the scaled framing project.

Demonstrate the technique for driving nails with a claw hammer.

Demonstrate techniques for holding materials being nailed (relate to techniques for holding full-sized materials).

Demonstrate toe-nailing and identify examples of where it is applied in wood frame construction.

Use the assembled project example to identify areas where the sequence of nailing is important.

A. Assemble corner posts before nailing plates.
B. Nail trimmer studs to sills before nailing trimmer studs to full-length studs

SUPPORT MATERIAL

SPECIAL NOTES--

1. Make nails conveniently available to students at work benches by dispensing in trays, cans or boxes so there will be no need for nails to lay loose on benches or floor.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.5.1

ACTIVITY--Demonstrate/Orient Students to Learning Activity Packages (2 LAP's)

PURPOSE--

1. To familiarize students with the LAP rotation schedule.
2. To enable students to perform two LAP's.
3. To organize the students into groups for working on the LAP's.

VOCABULARY--

REFER TO LEARNING ACTIVITY PACKAGES

PROCEDURE--	SUPPORT MATERIAL
Use a graphic representation to show students the schedule for completing the Learning Activity Packages.	Refer to LAP Rotation Schedule
Instruct the students in the procedures for completing two LAP's. Include information about industrial applications and career implications.	Refer to Learning Activity Packages
Organize students into groups of two for completing the Learning Activity Packages.	

SPECIAL NOTES--

1. To maximize effective use of demonstration time, prepare in advance examples of each completed step in the process being demonstrated. This will eliminate the need to continue with completing the step after the important procedures in the step are demonstrated.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.10.1

ACTIVITY--Demonstrate Cutting and Assembly of Roof Trusses

PURPOSE--

1. To enable students to produce roof trusses in the scaled framing activity.

VOCABULARY--

Rafter
Gusset
Ceiling Joist
King Post
Pitch

PROCEDURE--

Use a transparency to show students the roof truss detail drawing.

A. Correlate the drawing with an assembled roof truss example.
B. Emphasize the nomenclature for the roof truss.

Demonstrate marking and cutting of the roof truss members.

Demonstrate roof truss assembly using paper gussets, glue, staples, and assembly fixture.

SUPPORT MATERIAL

Drawing 6 of 7 for I.A. Framing Construction Activity

SPECIAL NOTES--

1. Teacher should construct 4 or 5 assembly fixtures for students to use in assembling roof trusses.
2. Special miter-box type sawing jigs may be constructed by the teacher for students to use in cutting angles on the truss members.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.17.1

ACTIVITY--Demonstrate Building Assembly

PURPOSE--

1. To enable students to assemble the Scaled Framing Project.

VOCABULARY--

Double Top Plate

PROCEDURE--	SUPPORT MATERIAL
Demonstrate nailing partitions through the sole plate to the floor.	
Demonstrate tieing partitions together by nailing to the corner posts.	
Demonstrate tieing partitions together by nailing a doubled top plate.	
Use a transparency to show the truss placement detail drawing. Explain the placement of roof trusses on the doubled top plate.	Drawing 7 of 7 for I.A. Framing Construction Activity
Demonstrate marking-off the placement of roof trusses on the top plate using a rule and square.	
Demonstrate nailing the trusses to the doubled top plate.	
Demonstrate the application of roof sheathing. (optional)	

SPECIAL NOTES--

NONE

COURSE Industrial Arts Exploration 8 COURSE NO.

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.19.1

ACTIVITY--Demonstrate and Discuss Theory of 4-Cycle Gasoline Engine Mechanics

PURPOSE--

1. To familiarize students with the operation of the Otto (4-stroke) cycle gasoline engine.
2. To introduce students to tools and procedures used in small engine repair.

VOCABULARY--

Piston	Piston Ring	Power Stroke
Valve	Carburetor	Exhaust Stroke
Crank Shaft	RPM	Ignition
Flywheel	In-Take Stroke	Spark Plug
Cam	Compression Stroke	Breaker Points

PROCEDURE--	SUPPORT MATERIAL
Discuss with students the significance of the gasoline engine in terms of: A. importance in transportation, past and present. B. value as a stationary power source for equipment and generators. C. an engineering and production accomplishment.	
Describe for students the 4-stroke Otto cycle.	DCA, Small Gas Engines Transparency: T-1
Trace the flow of air and fuel into the engine and out the exhaust using a disassembled engine and visual diagram. Emphasize the following:	DCA, Small Gas Engines Transparency: T-6
A. Venturi principal for mixing air and fuel in the carburetor B. Cam actuation of intake and exhaust valves C. Function of the spark plug D. Oil seal and compression function of piston rings E. Function of crank shaft--convert reciprocating motion (back and forth) to rotary motion F. Function of the flywheel	DCA, Small Gas Engines Transparency: T-8
Install the crank, connecting rod, and piston in the engine block with student assistance. Turn the crank for students to observe the motion and review the Otto cycle.	

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.19.1 (continued)

SPECIAL NOTES--

1. Prior to the lesson, disassemble the engine to the point of removing the crank, connecting rod, and piston.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

5. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.20.1

ACTIVITY--Summarize Course Implications for Career and Educational Planning

PURPOSE--

1. To relate for students the class experiences to high school offerings.
2. To correlate for students the high school offerings with careers.

VOCABULARY--

NONE

PROCEDURE--	SUPPORT MATERIAL
Relate the various course activities appropriately to high school courses in Construction and Energy and Transportation	Transparency: T-8.1.1-5
Relate the high school courses in Construction and Energy and Transportation to career opportunities.	Transparency: T-8.1.1-5 "Correlation of H.S.I.A. Courses with Occupational Titles in the D.O.T."

SPECIAL NOTES--

NONE

COURSE Industrial Arts Exploration 8 COURSE NO. _____

8. NOTES ON TEACHER DIRECTION AND STUDENT PARTICIPATION

NOTES CODE 8.21.1

ACTIVITY--Flexible Day Activities

PURPOSE--Flexible days may be used:

1. To provide course enrichment which can be directed by a substitute in the teacher's absence.
2. To provide course enrichment directed by the teacher.
3. To compensate for class progress falling behind schedule.

VOCABULARY--

TO BE IDENTIFIED BY THE TEACHER.

PROCEDURE--	SUPPORT MATERIAL
Course enrichment lessons may include teacher demonstrations and/or student activities with career or consumer implications in the areas of construction, energy, and transportation.	
Substitute lesson plans and course enrichment lessons may include the use of audio-visual materials.	See listing below

"This World of Energy" (Filmstrips with Tapes) National Geographic Society.

"Transportation in America" (Filmstrips with Tapes) National Geographic Society.

"Exploring the Construction Industry" (Filmstrips with Tapes) McKnight Publishing Co.

"Introduction to Construction Careers" (Filmstrips with Tapes, Transparencies) McKnight Publishing Co.

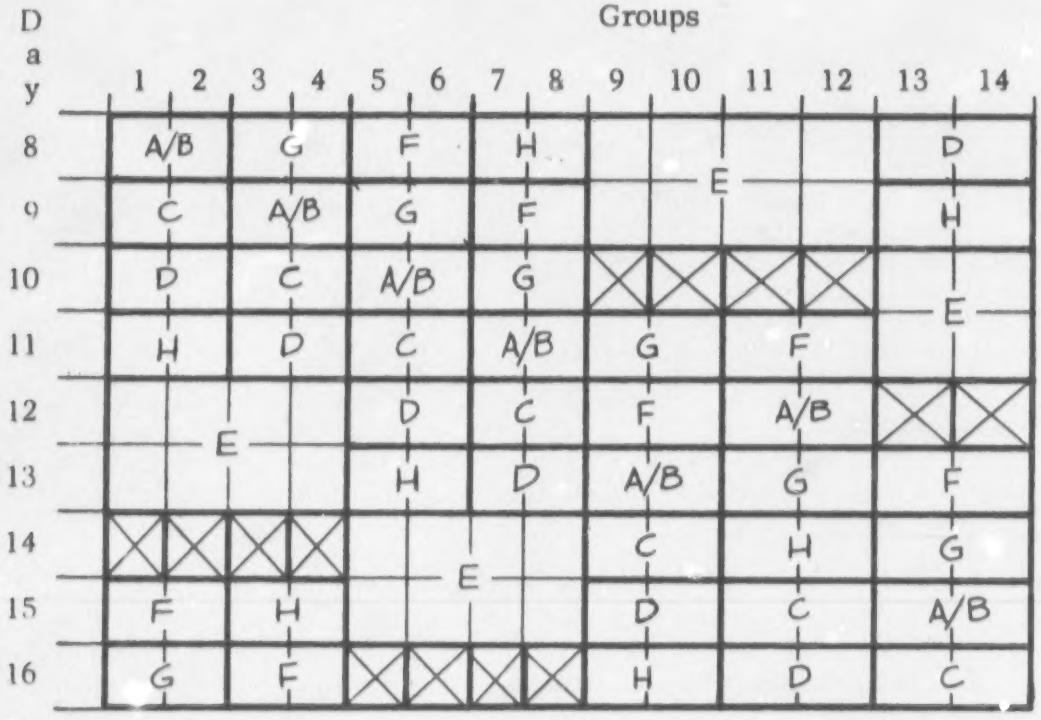
SPECIAL NOTES--

NONE

COURSE Industrial Arts Exploration 8 COURSE NO.

6. LEARNING ACTIVITY PACKAGE ROTATION SCHEDULE

CODE	LEARNING ACTIVITY PACKAGE	QUANTITY
A/B	Copper Tubing/Faucet Repair	2
C	Electrical Wiring	2 per class
D	Bricklaying or Concrete	2
E	Drywall	4 per class
F	Door Hardware	1 or 1 per class
G	Window Glazing	2 or 1 triple pane
H	Career Investigation	



Teachers must organize a rotation schedule for all LAP's, as above. Pairs of students, in turn, will complete each LAP. An on-going activity (the framing construction activity) will provide a purposeful activity for students to pursue in times when the next LAP in their rotation is not available.

COURSE Industrial Arts Exploration 8 COURSE NO. _____

7. STUDENT EVALUATION

CRITERIA--

Criterial for evaluating students must include the student's demonstration of skills and knowledge in meeting the nine (9) stated course objectives on page 32 of this guide. The stated objectives, in most cases, are sufficiently broad to allow the teacher to enumerate more specific lesson objectives. The lesson objectives will identify specific skills and knowledge which students will demonstrate. Demonstration of these skills and knowledge may be observed through student performance in one or more of the following, as appropriate: laboratory work, planning activities, worksheets, quizes, class discussion, and written assignments.

RECORDKEEPING--

Student performance in meeting cirteria for evaluating skills and knowledge must be documented. An example evaluation record is included in Appendix 8 of this guide.

8. APPENDIX

What's the Value to Me?

TRY SOME JOB ACTIVITIES--

- find out what you may like and dislike

LEARN PRACTICAL SKILLS AND KNOWLEDGE--

- useful in many careers
- useful to consumers
- useful in recreation

Career Value of INDUSTRIAL ARTS

Industrial Arts helps to discover interests and abilities in many technical areas.

Careers which involve working with tools and materials are open to both man and woman.

The number of women in technical careers is growing each year.

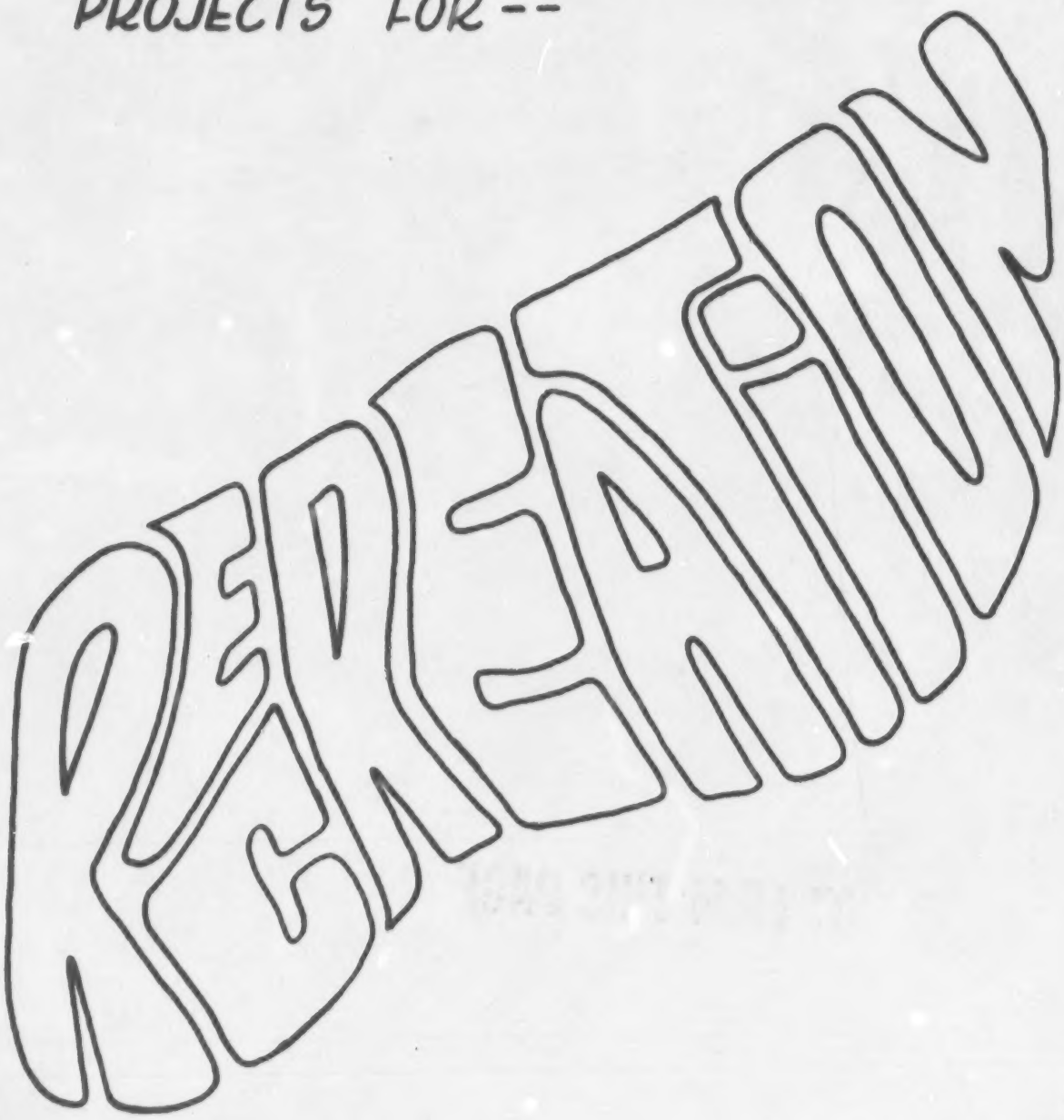
INDUSTRIAL ARTS

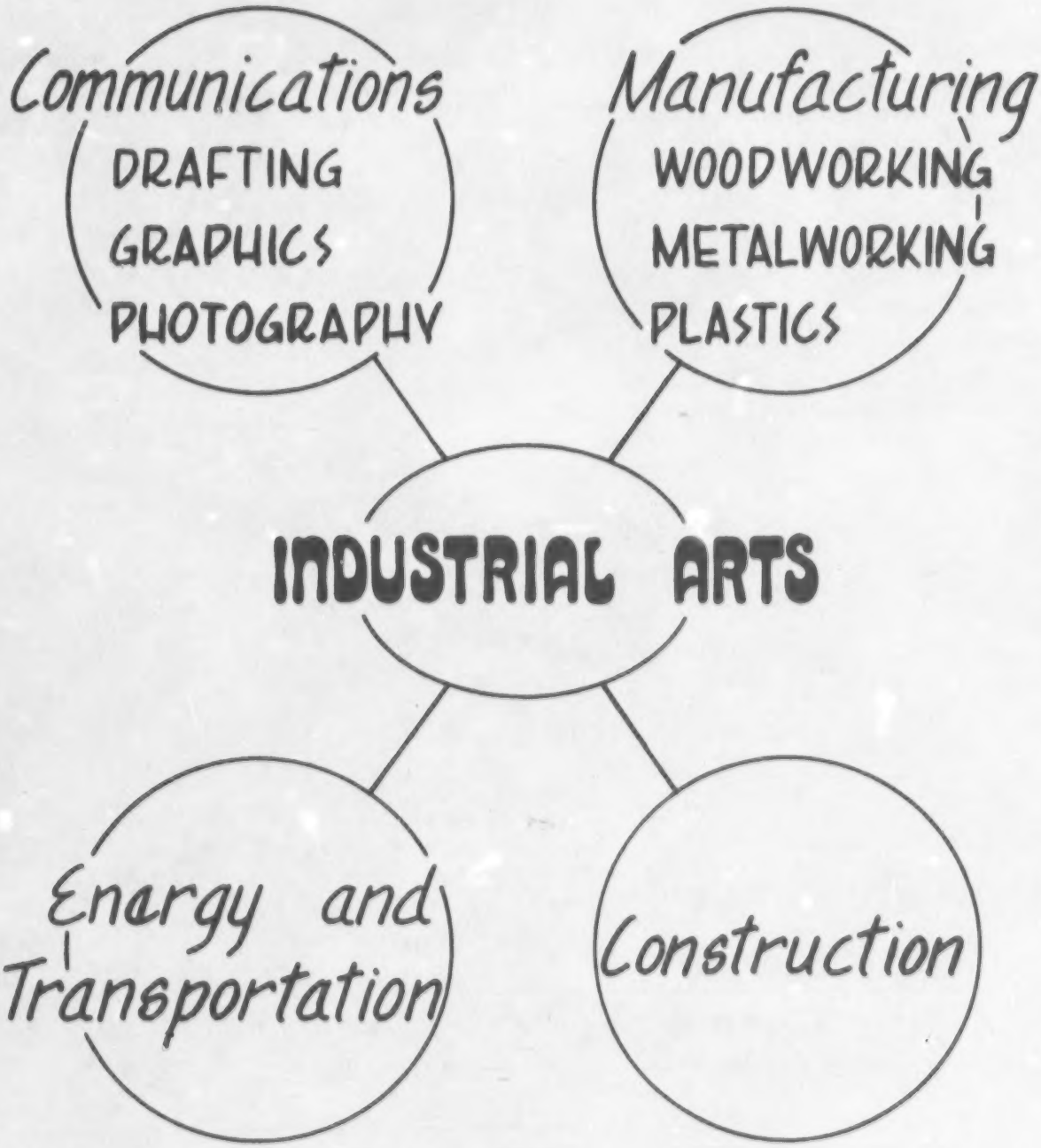
Consumer Value --

CONSUMERS WHO HAVE KNOWLEDGE AND ABILITY TO USE TOOLS AND MATERIALS ARE:

- BETTER JUDGES OF PRODUCT AND SERVICE QUALITY
- ABLE TO SAVE MONEY WITH "DO IT YOURSELF" PROJECTS
- MORE AWARE OF REQUIREMENTS FOR PRODUCT SERVICE AND MAINTENANCE

USE TOOLS AND MATERIALS TO DO HOME AND COMMUNITY PROJECTS FOR --

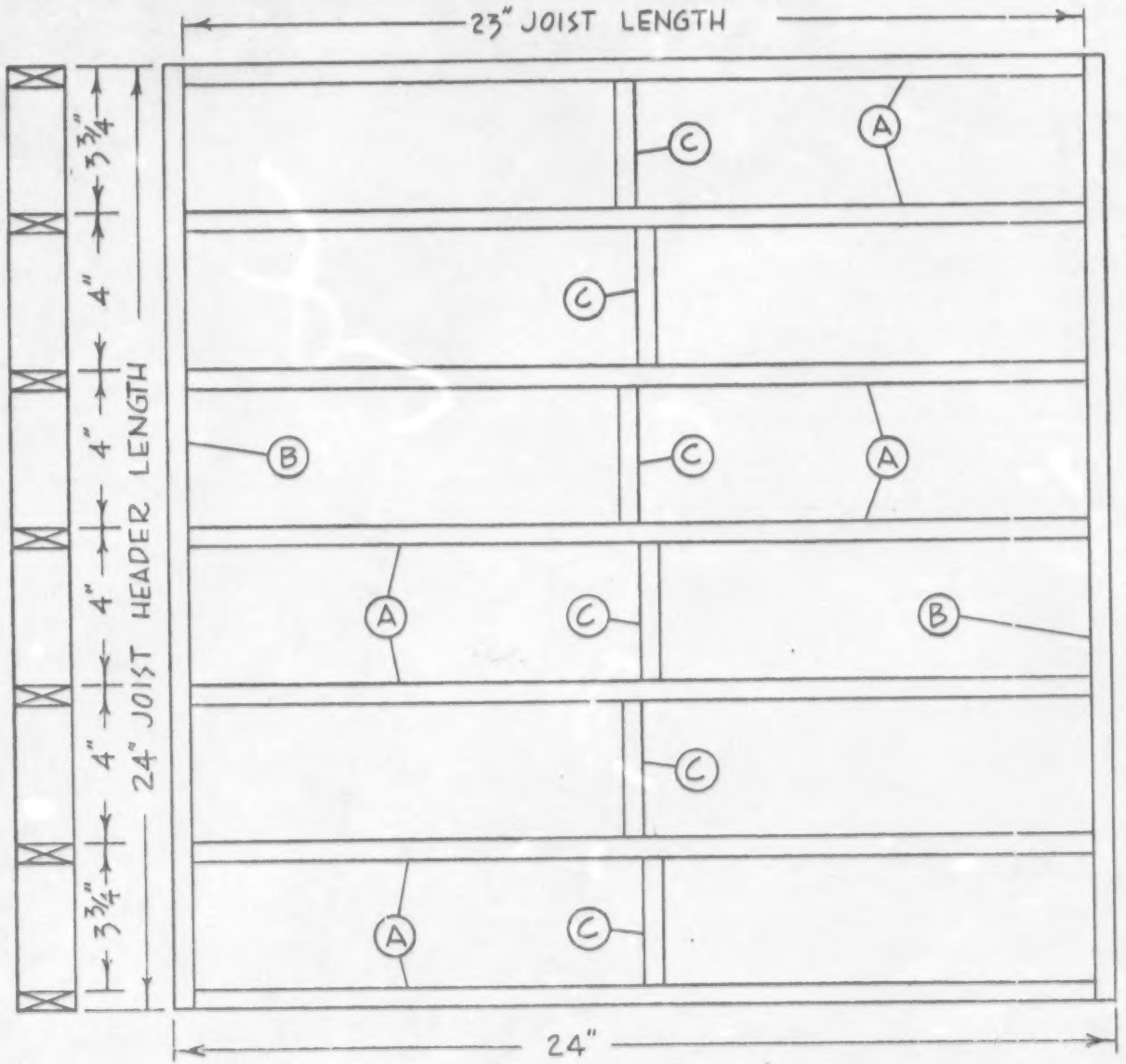



Communications
DRAFTING
GRAPHICS
PHOTOGRAPHY
Manufacturing
WOODWORKING
METALWORKING
PLASTICS
INDUSTRIAL ARTS
Energy and Transportation
Construction

SUCCESS

in Industrial Arts is:

- TRYING ALL THE TIME
- USING TOOLS AND MATERIALS CAREFULLY
- USING TIME WISELY
- WORKING COOPERATIVELY TOGETHER



NOTE:
FLOOR FRAMING MEMBERS ARE ½" × 1½" MATERIAL.

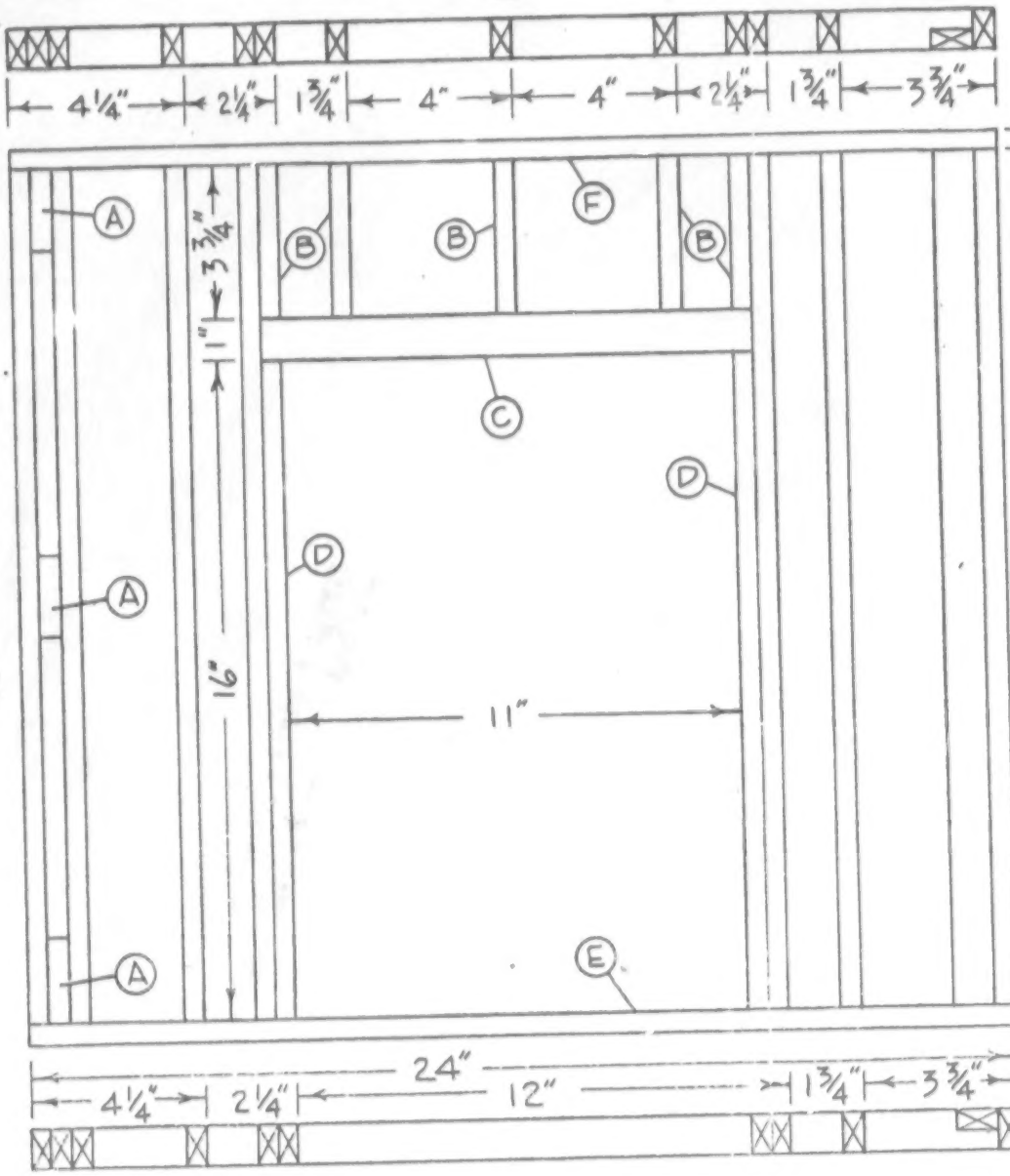
KEY TO SYMBOLS

(A) JOIST

(B) JOIST HEADER

(C) BRIDGING

	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	FLOOR JOIST DETAIL	SCALE ¼" = 1"	SHEET 2 of 7



NOTE:
WALL FRAMING MEMBERS ARE ½" x 1" MATERIAL

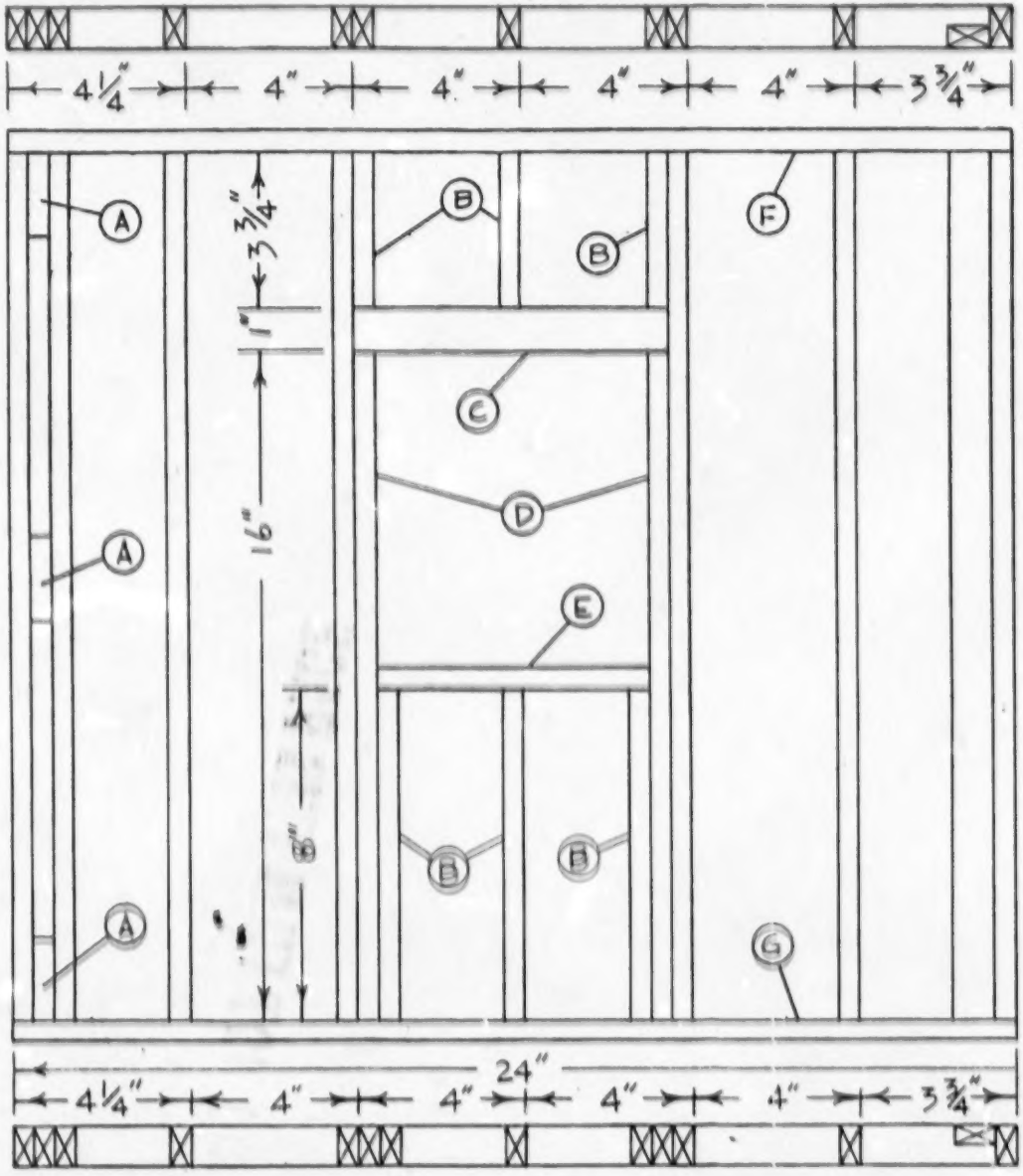
KEY TO SYMBOLS

- (A) SPACER BLOCK
- (B) CRIPPLE STUD
- (C) HEADER
- (D) TRIMMER STUD
- (E) BOTTOM PLATE
- (F) TOP PLATE

	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	FRONT WALL DETAIL	SCALE ¼" = 1"	SHEET 3 of 7

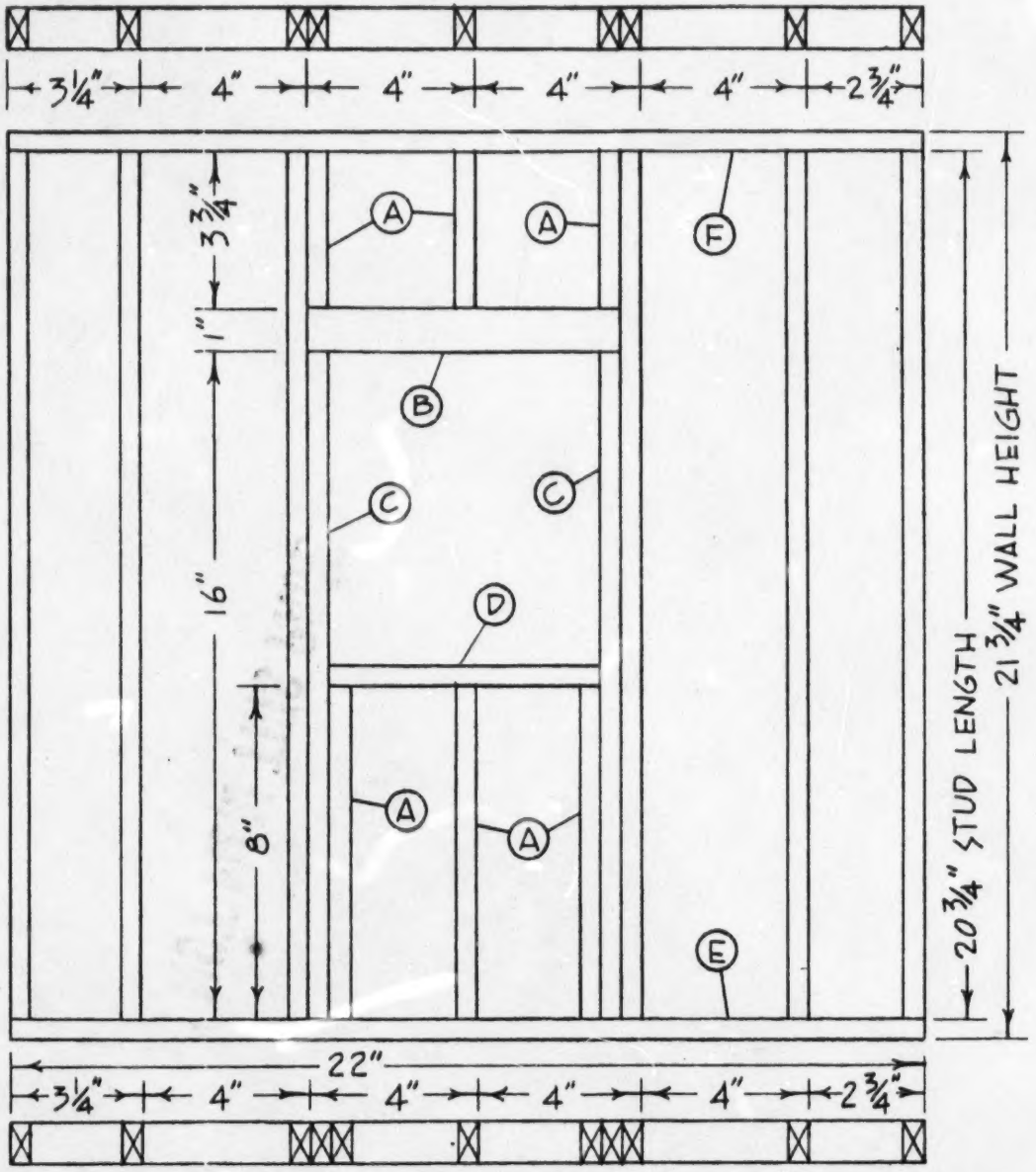
KEY TO SYMBOLS

- (A) SPACER BLOCK
- (B) CRIPPLE STUD
- (C) HEADER
- (D) TRIMMER STUD
- (E) SILL
- (F) TOP PLATE
- (G) BOTTOM PLATE



NOTE:
WALL FRAMING MEMBERS ARE ½" × 1" MATERIAL

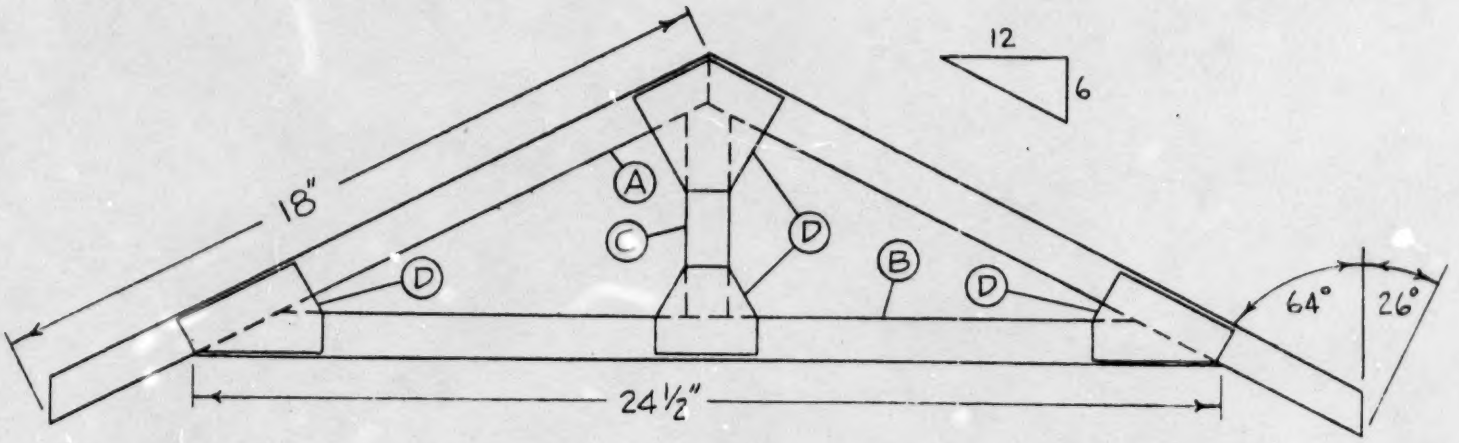
	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	REAR WALL DETAIL	SCALE ¼" = 1"	SHEET 4 of 7



9

	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	SIDE WALL DETAIL	SCALE ¼" = 1"	SHEET 5 of 7

NOTE:
TRUSS MEMBERS
ARE ½" × 1" MATERIAL



KEY TO SYMBOLS

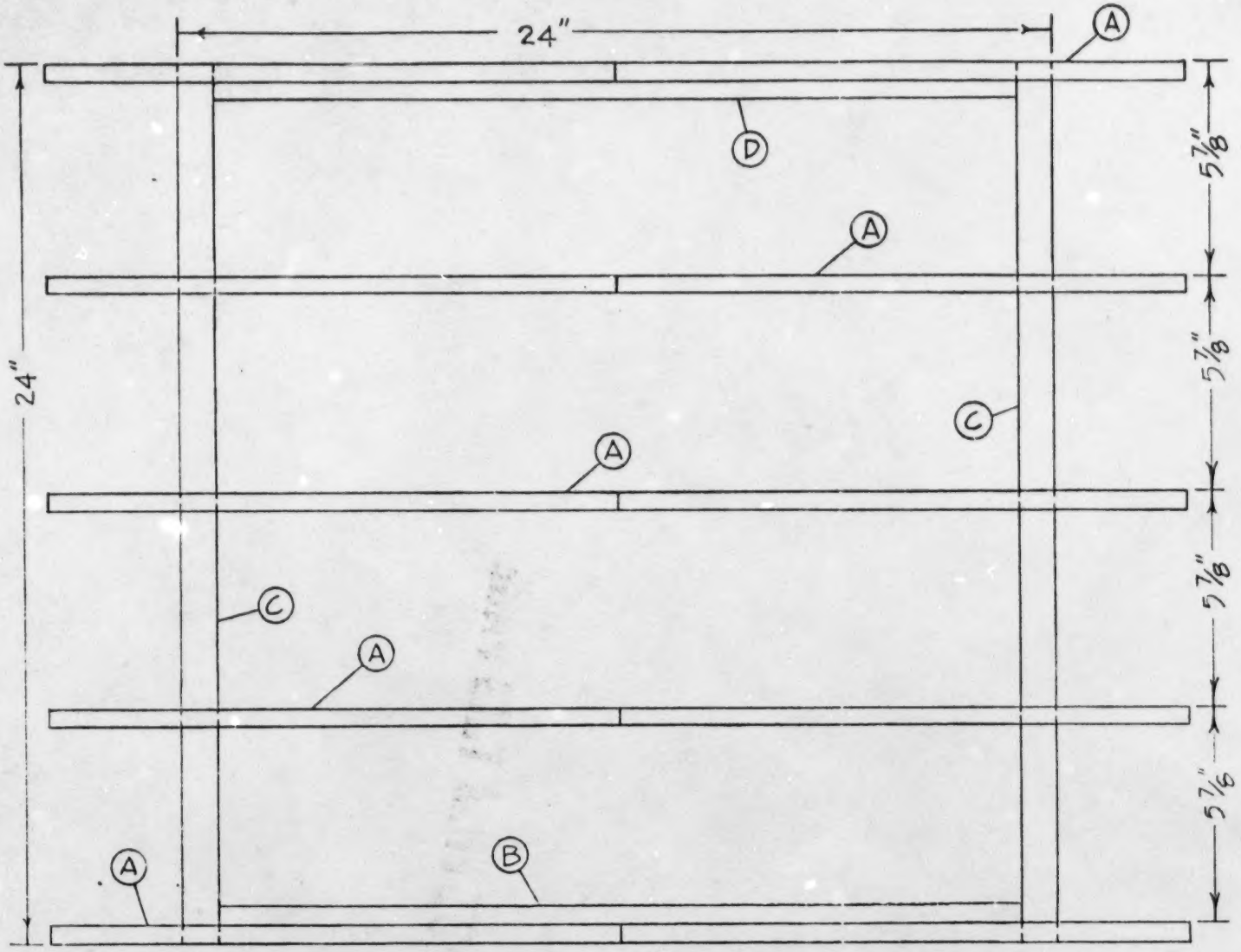
(A) RAFTER

(B) JOIST

(C) KING POST

(D) GUSSET

	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	KING POST TRUSS DETAIL	SCALE ¼" = 1"	SHEET 6 of 7



KEY TO SYMBOLS

(A) TRUSS (B) FRONT TOP PLATE (C) SIDE TOP PLATE (D) REAR TOP PLATE

102	INDUSTRIAL ARTS FRAMING CONSTRUCTION ACTIVITY	TRUSS LAYOUT	SCALE $\frac{1}{4}$" = 1"	SHEET 7 of 7

INDUSTRIAL ARTS
HOUSE FRAMING PROJECT
FOREMAN'S CHECKLIST

CONSTRUCTION FOREMAN_____ GROUP_____

FRONT WALL FRAME BY_____

	DATE COMPLETED	APPROVED BY
Plates are marked correctly		
Plates are cut to right length		
Studs are marked correctly		
Studs are cut to right length		
Plates and studs are nailed correctly		
Header is installed correctly		

LEFT WALL FRAME BY_____

Plates are marked correctly		
Plates are cut to right length		
Studs are marked correctly		
Studs are cut to right length		
Plates and studs are nailed correctly		
Header and sill are installed correctly		

RIGHT WALL FRAME BY_____

Plates are marked correctly		
Plates are cut to right length		
Studs are marked correctly		
Studs are cut to right length		
Plates and studs are nailed correctly		
Header and sill are installed correctly		

REAR WALL FRAME BY_____

Plates are marked correctly		
Plates are cut to right length		
Studs are marked correctly		
Studs are cut to right length		
Plates and studs are nailed correctly		
Header and sill are installed correctly		

FLOOR FRAME BY_____

Joist headers are marked correctly		
Joist headers are cut to right length		
Joists are marked correctly		
Joists are cut to right length		
Joist headers and joists are nailed correctly		
Bridging is installed correctly		

OCCUPATION_____ NAME_____

DATE_____

PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
INDUSTRIAL ARTS CAREER INVESTIGATION
WORKSHEET

1. What level of schooling is required for this occupation? Check (✓) below.

   _____ a. High School
   _____ b. Trade/Vocational School
   _____ c. Junior or 2-Year College
   _____ d. College Degree
   _____ e. Graduate Degree

2. What courses could you take now or before graduating from high school that would help prepare you for this occupation? List below.

   _____
   _____
   _____
   _____
   _____
   _____

3. Are any of the following required for this occupation? Check (✓) below.

   _____ a. On-the-job experience
   _____ b. Apprenticeship
   _____ c. Internship
   _____ d. State License

4. What does a person do in this occupation? List 3 or 4 specific duties or skills required.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

5. What skills do you now have that would help you in this type of work? List below.

   _____
   _____
   _____
   _____
   _____
   _____

6. Does the work of this occupation require more mental skill, or more physical skill? Check (✓) below.

   _____ a. Requires more mental skill
   _____ b. Requires more physcial skill
   _____ c. Requires about the same amount of mental and physical skill

7. What earnings does a person starting in this occupation usually get? Check (✓) below.

   _____ a. Under $5,000 per year
   _____ b. Between $5,000 and $10,000
   _____ c. Between $10,000 and $20,000
   _____ d. Over $20,000

8. What earnings does a person with several years experience get in this occupation? Check (✓) below.

   _____ a. Under $5,000 per year
   _____ b. Between $5,000 and $10,000
   _____ c. Between $10,000 and $20,000
   _____ d. Over $20,000

9. Are there many openings for new people in this occupation? Check (✓) below.

   _____ a. Yes, but not for long
   _____ b. Not at the present time
   _____ c. Many openings in the future

10. How would you describe the physical activities of this occupation? Check (✓) below.

    _____ a. Strenuous
    _____ b. Moderate (Medium)
    _____ c. Light

11. What parts of this job do you like and dislike? List below.

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION

General Safety Quiz

Circle T for True or F for False beside each sentence.

T F 1. If you see something that is unsafe, you should tell the teacher right away.
T F 2. Only serious accidents need to be reported to the teacher.
T F 3. Safety goggles are needed only when you are operating a machine.
T F 4. Loose sleeves should be rolled up when you use machines.
T F 5. Carry sharp or pointed tools facing down and away from others.
T F 6. The machine operator is the only person who should turn on the machine.
T F 7. The safety zone is a safe place to watch other people work.
T F 8. Never bother or talk to a machine operator.
T F 9. You should run in the shop to save time.
T F 10. Never throw objects in the shop.

Multiple Choice - Circle the Letter before the best choice to complete the sentence.

11. Loose Clothing should be:
    a. worn as it is
    b. returned to lost and found
    c. removed or corrected
    d. none of the above

12. Shoes that are worn in the shop should be:
    a. sandals
    b. shower clogs
    c. worn with shoelaces untied
    d. closed at both heel and toe

13. The hazard of long hair could be fixed by a
    a. hair net
    b. rubber band
    c. head band
    d. all of the above

14. Rings, medallions or any dangling jewelry should be:
    a. polished and buffed
    b. removed and put away
    c. held in one hand while working
    d. left on tables at your assigned seat

15. When handling large, heavy or bulky items you should:
    a. do it alone to avoid confusion
    b. get someone to help you
    c. use your back muscles
    d. make sure you wear a face shield

16. Posted rules on each machine are:
    a. reminders in case you are unsure of yourself
    b. for your protection
    c. to be followed at all times
    d. all of the above

17. Use only equipment:
    a. the teacher permits you to use
    b. the teacher has demonstrated to you
    c. you know how to use
    d. all the above

18. Tools and equipment should be used:
    a. when permitted by the teacher
    b. at any time you desire
    c. during roll call
    d. during clean up

19. If you have an accident, no matter how small, you should:
    a. go to the health aide on your own
    b. wash it
    c. report it to the class foreman
    d. report it to the teacher immediately

20. When uncertain about proper and safe procedures to follow, you should:
    a. ask the principal
    b. ask the teacher
    c. put on goggles and proceed
    d. sit down and do your homework

NAME_____ TEAM_____ DAY_____ DATE_____

INDUSTRIAL ARTS EXPLORATION 8

QUIZ--CROSSCUTTING AND NAILING

INSTRUCTIONS: Circle the correct answer, T for true, F for false.

T F 1. Sawing across the wood grain is called crosscutting.

T F 2. Sawing in the same direction as the wood grain is called slicing.

T F 3. A handsaw cut is started by pulling the saw back a few strokes.

T F 4. The blade guide on the bandsaw must be adjusted to about one inch above the material being cut.

T F 5. Avoid backing out of a cut while the bandsaw is running.

T F 6. Wood should be pushed slowly into the bandsaw blade.

T F 7. Always keep your hands right in front of the bandsaw blade.

T F 8. When you use the bandsaw, always keep your fingers to the side of the cutting line and never on the cutting line.

T F 9. All bandsaw adjustments should be made with the machine turned on.

T F 10. A face shield should be worn with your safety glasses when operating the bandsaw.

T F 11. Use a square when marking lines for crosscutting.

T F 12. Nailing at an angle through the side of a board is called toe-nailing.

T F 13. Nails should be twisted when pulling them out.

T F 14. A hammer claw should rock back like a rocking chair when pulling out a nail.

T F 15. When nailing, hold the claw hammer handle near the hammer head.